Preliminary Hydrology Study

December 22, 2023

APN: 0463-213-26, 27, 28

Johnson Road

Industrial Building

RBS PROJECT NO: 220033

San Bernardino

PROFESSIONAL ENGINEER'S AFFIRMATIVE STATEMENT

I have examined and am familiar with the information in this document and all appendices, and based on my inquiries of individuals immediately responsible for obtaining the information in this document, I believe that the information is true, accurate, and complete

Prepared by

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Table of Contents

Appendix A

Appendix B

I. INTRODUCTION

Location of Property

The proposed project consists of three (3) undeveloped parcels in the County of San Bernadino, California in the Town of Apple Valley at the Northwest corner of the intersection of Navajo Road and Johnson Road. The land area is 20.54 acres consisting of Assessor's Parcel Numbers (APN) 0463-213-26, 27, and 28. See the adjacent figure, Exhibit A for Location Map and Exhibit B for Land Use Map.

The three undeveloped lots have improved access on the south along Johnson Road, unimproved access along Navajo Road on the east; and vacant land abutting the west and north sides of the site.

Project Description

After the dedication of 2.34 acres to street right-of-way, the remaining 18.20-acre site is proposed to be developed as one (1) parcel with an approximately 410,000 square foot industrial building with associated truck docks and truck and vehicle parking on it. There is limited landscaping proposed for the site.

Purpose and Scope

The purpose of this study is to analyze the combined on-site and off-site flows for the existing and developed conditions in order to obtain the differential volume need to be stored such that only historical volumes of storm water are released to the dry lakebed. The differential storm water volume will be retained on site and infiltrated into the ground water basin. Building PADS will be elevated such that a 1-foot elevation above the neighboring flood water surface elevation to protect the property from flood and storm water damages.

Methodology

This study is based on the San Bernardino County Hydrology Manual, Detention Basin Design Criteria for San Bernardino and the April 6, 2010, Addendum that addresses the Antecedent Moisture Condition (AMC) for arid regions of the County, and CivilDesign Rational Method and Unit Hydrograph Software to model the storm channel flows.

The following criteria were used to calculate the flows:

1. Current land use: Vacant Land
2. Proportion Impervious: Pre-Developed: 10%.
   Post-Developed: 15%
3. Intended Use: Industrial Building and Truck/Employee Parking
4. Soil Type: Hydrologic Soil Group A, C, & D
5. NOAA 14 Precipitation Frequency: 100-year 1-hour=1.08 inches
   100-year 6-hour=2.01 inches

		100-year 24-hour=3.43 inches
6.	San Bernadino County Hydrology Manual	Unit Hydrograph Method

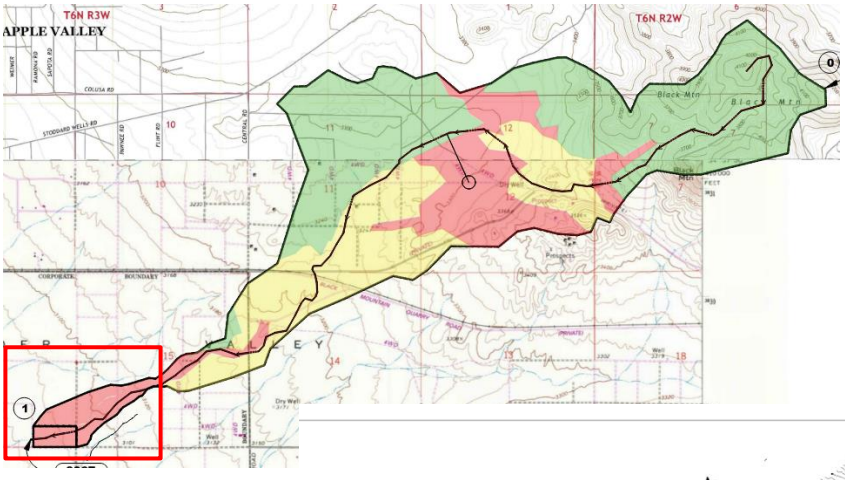
Floodplain Information

The project site is located inside of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map Panel 06071C5830H effective August 28, 2008. This panel indicates that the site is located within Zone D, defined by FEMA as "Area with Flood Risk Due to Levee." (See Appendix A, Exhibit E) for San Bernardino County.

II. OFF-SITE HYDROLOGY

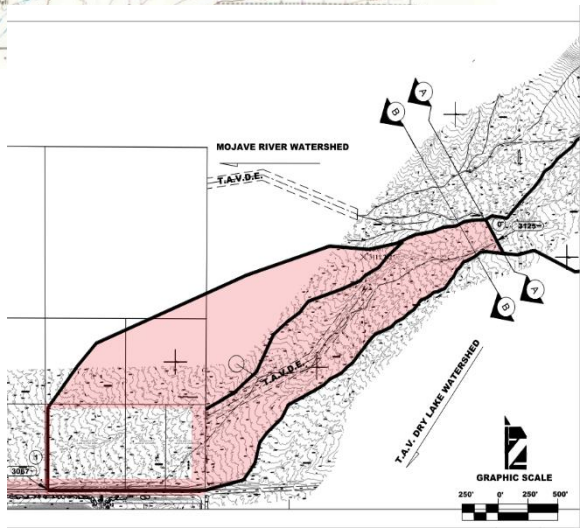
Off-Site Drainage Description

The off-site area that contributes drainage to this site consists of approximately 1956 acres and extends to the north and northeast of the site. The land is undeveloped, relatively flat at the lower elevations, and steep and rocky at the upper elevations. Vegetation consists of fair coverage of sage brush and annual plants.



Pre-Developed Off-Site Hydrology

As shown on the exhibit F the off site watershed has a 1956-acre tributary area with a total flow length of 5.97 miles and a centroid located 3.32 miles up from the lowest point in the watershed being the southwest corner of the property. A Lag calculation was performed resulting in a lag of 0.91 which was entered into the San Bernardino County Hydrology Manual and CivilDesign Unit Hydrograph Software program resulting in an overall peak storm flow of 1680.56 CFS. with an associated volume of 433 acre-feet of storm water.



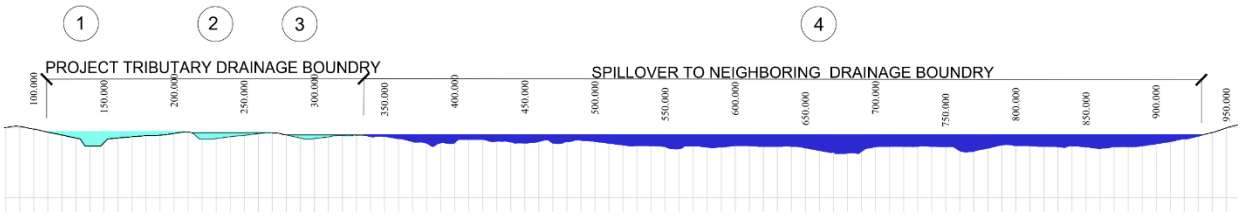
Pre-Developed Off-Site Hydraulics

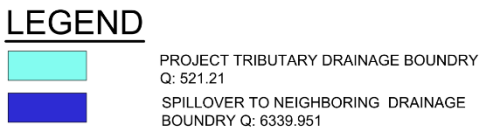
Although the off-site watershed lies within the Town of Apple Valley Dry Lake watershed draining south to the dry lakebed, its northern border is the division line between the Dry Lake watershed and the Mojave River Watershed. As the storm flows build from the northeast, the storm flows will become larger and larger until they exceed the capacity of the natural channels within the off-site watershed

boundary and sheet flow to the north into the Mojave River watershed channels that have much greater capacity to retain these flows.

This is pronounced at Sections A-A and B-B (see Exhibit I) where the tributary watershed within the dry lakebed watershed necks down to a narrow channel area with a limiting capacity of 521 cfs for channels 1-3 per Section A-A below.

SECTION A-A





However, channel area 4, which is the Mojave River Watershed, has a limited capacity of 6,340 cfs. (See Exhibit I for Mannings calculations)

The 521 cfs portion of the flow that is tributary the project site will continue flowing southwest and confluence with the 30.4 acres tributary to the westerly property line.

Pre-Developed Off-Site Hydrology South of Section A-A

As shown on Exhibit G & Exhibit I and limitations associated with Section A-A above, only 521 cfs is passing through of 1681 cfs tributary to the site. Since 521 cfs is 31% of the total 1681 cfs, the volume would be 31% of the total volume of 433 acre feet, which is 134.23 acre feet. This flow will remain constant for the pre and post developed conditions.

As stated previously, the 521 cfs flow directed toward the project will remain constant before and after development. The portion of the watershed after section A-A covers 85.83 acres, including our site. The comparison of this 85.83 acres was performed using the San Bernardino County unit hydrograph method. The soils of this area consists of 2 types: Cajon-Arizo Complex and Helendale-Bryman Loamy Sands. The Cajon-Arizo complex is a Group A type soil with a CN value of 46 representing 19.48 acres. The remaining 66.35 acres of Helendale-Bryman Loamy Sands are a mix of 60% Group A and 40% Group C which equals 39.81 acres of Group A and 26.54 acres of group C. Total Group A soil equals 59.29 acres or 69% with the remainder being Group C soil. The longest flow path is 4521 ft., with an elevation change of 59 ft. The length to the centroid is 2124 ft.

Pre Developed Hydraulics South Section A-A

At this point it was determined that an additional 167.76 cfs (see exhibit H) would add on as the flows travel to the southwest corner of the site for a total of 688.76 cfs as and an additional volume associated with this flow is 12.93 acre feet for a total of (134.23 +12.93=) 147.16 ac-ft

The tributary 85.83 watershed South of section A-A is comprised of two off-site watersheds along the north boundary and the east boundary along with the remaining on-site acreage.

Table 1

Tibutary Water Shed	South A-A			North A-A	Total Trib Flow
	AC	%AC	Q-cfs	Q-cfs	Q-cfs
	85.83	100%	167.76	521	688.76
On-Site	20.54	24%	40.15	0	40.15
Northern PL	34.89	41%	68.19	0	68.19
Eastern PL	30.4	35%	59.42	521	580.42

Table 1 above shows the acreage for the individual watersheds along with their percentage of the overall 167.76 CFS flows. The 521 cfs watershed north of section A-A flows combined only with the "Eastern Pl" 30.4 acre 59.42 cfs flows for a total 580 cfs influencing the easterly boundary

Post-Developed Hydrology

When considering a volume-based reduction associated with the dry lakebed, the change in volume is subject to the change in Ap (pervious Area). Thus, a conservative approach would be to assume the whole site is effectively impervious. Considering that the entire 20-acre site becomes impervious is the same as assuming the Ap is zero for the site which then makes the CN value for the site 98. The on-site 20.54 acres represents 24% of the 85.83-acre watershed which means that 76% of the watershed could be considered pervious.

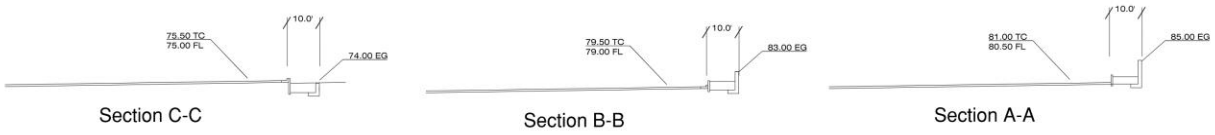
Using this information, a second unit hydrograph was run to determine the increased flows and volume associated with development. The report indicated that the peak cfs would increase to 172.26 cfs and the volume would increase to 14.46 acre feet. Adjusting the predeveloped volume to 90% (12.93*0.9=11.64) results in a target volume of 11.64 acre feet. Subtract this from the post developed volume of 14.46 acre feet (14.46-11.64=2.82), shows that 2.82 acre feet needs to be retained and infiltrated on site to mitigate the volume change going to the dry lakebed.

Post-Developed Hydraulics

The neighboring property to the east will be graded to channelize the 580.42 cfs storm flows and convey them south to the Johnson Road where they are directed west within a combined road and side channel conveyance system around the south side of the building and street section and released into the historic natural drainage conveyance west of the project site.

The northerly 68 cfs tributary flows that impact the northern property line will be collected in a channel system between the parking and the northern property line as detailed in Sections A-A through C-C shown below. Exhibit J provides a Mannings calculation showing that the proposed channel can capture the 68 cfs OF off-site flows and convey them west at a depth of 1.68 feet. Since the channel is receiving water its whole length, the size of the channel can vary in with from the 5 ft. at the west end to 2.5 ft at the easterly end. The west end is designed to carry the full 68 cfs whereas the channel at the east end is

designed to capture 40% of the flow with the same depth. These flows will empty into the retention basin along the west property line which is sized to retain 2 acre feet of the 5.26 acre feet (12.93*41% = 5.26) associated with the northern flows.



Infiltration Basin Sizing of Off-Site Flows.

To meet the infiltration requirements, 2 basins have been utilized. One along the western property line 533-ft long with a cross-sectional area of 163.5 square feet. The other basin along Johnson Road utilizes a sharp crested weir configuration to create a drop structure that will hold back a portion of the channelized flows. The channel area at depth "P" will be utilized as an infiltration basin. The holding capacity for the 2 basins consists of the following:

Johnson Road Basin:	0.82 AF
Western PL Basin:	2.0 AF
Total:	2.82 AF

The sharp crested weir calculation is based on "Kindsvater-Carter Method" Equation:

Q=CeLeHe^1.5

Le=L+kb	L=25	B=31	kb=0.0145
He= H+kh	P=4.25	H=3.4	kh= 0.003
Ce=3.7			

Where:

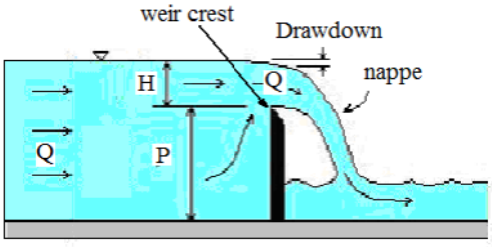
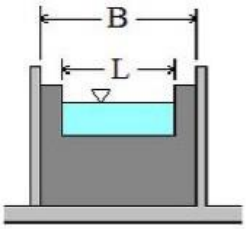


Figure 1. Longitudinal Section, Flow Over a Sharp-crested Weir



(c) contracted rectangular

The use of this equation resulted in a Q of 581 at the western weir when L= 25. The total 2.82 af is greater than the 0.86 af required under the WQMP study performed at the end of this report.

On-Site Post Developed Hydrology

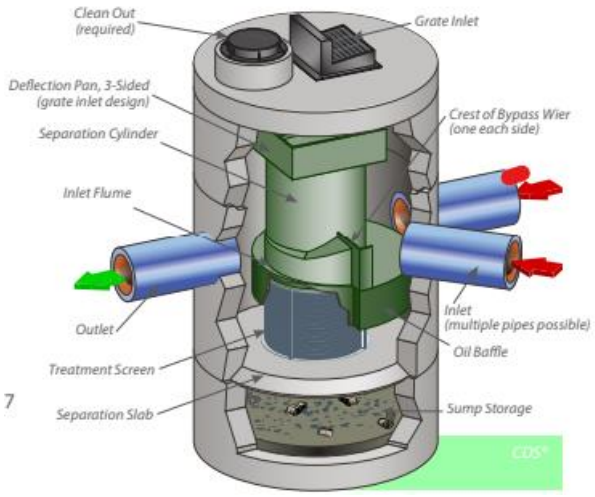
As previously determined the predeveloped regional flows below Section-A are 167.76 CFS, of which per table 1, the on-site 20-acre developed 40.15 cfs which is consistent with the high desert in general. The post developed hydrology for the same area determined the flows to be 172.26 cfs. The (172.26-167.76=) 4.5 cfs results from the develop of the site. Thus, the developed on-site flows are 40.15+4.5 = 44.65 cfs is generated. Due to the placement of the building 53% of the 44.65 cfs which is 23.66 cfs flows north of the building and 20.99 cf cfs flows south around the building.

On-Site Post-Developed Hydraulics

Given the information above requires a storm drain system to convey the northerly 23.66 on-site flows and the southerly 20.99 cfs around the structure, it was determined that and 18" storm drain sloped at 0.5% can convey approximately 8 cfs, and a 24" storm drain at the same slope can convey approximately 17.2 cfs. Flow exceeding in excess of 17 cfs and up to 23.66 cfs can be conveyed in a 24" storm drain by varying the slope from 0.5% to 1.0%.

Clarifiers – CDS System Sizing

In order to protect off-site flows from on-site contaminated flows, two Contech CDS System clarifiers CDS2020-5 will be installed to treat up to 24 cfs of on-site flows prior to exiting the site into the off-site drainage conveyance channels. The CDS System separates and traps trash, debris, sediment, and hydrocarbons from storm water runoff.



III. CONCLUSIONS

The proposed project will follow regional and local laws and ordinances that require a portion of the on-site rainfall to be stored on-site and eventually infiltrate into the ground.

Off-site flows will need directed around the site via a storm drain system to convey the northerly 68 cfs tributary flow and the easterly 580 cfs tributary flows. In the body of the report it was determined that a 5 foot wide "U" shaped channel flowing at a depth of 1.68 feet could provide the capacity to transport the 68 cfs flow to the westerly basin. In addition a combined street/channel section consisting of the full

right-of-way of Johnson Road and 6 foot deep trapezoidal channel with a base width of 6 feet which will convey the 580 cfs tributary to the eastern property line and then west along Johnson Road.

It was determined requires 2.82 af of infiltration to mitigate the volume going to the dry lakebed. The Johnson Road channel system will also house 0.82 af, and the westerly property line basin will house 2 af which will satisfy the 2.82 af requirement.

On-site flows were determined to be 23.66 cfs flowing west along the north side of the building and 20.99 cfs flowing along the south side of the building. A storm drain system consisting of 18” and 24” dia. pipe shall be employed at a minimum of 0.5% slope to intercept roof drains and capture surface flows and convey them to the westerly basin.

All On-Site flows will be directed through a clarifier prior to infiltration or releasing into the water course. When all systems are installed, the project will be protected from off-site flows and flooding from on-site developed flows. Thus, the project meets the requirements for Flood Protection as outlined in the San Bernardino County Hydrology Manual.

APPENDIX A

Exhibits:

Location Map – A

Land Use Map - B

USDA Tributary Area Soil Report – C

USDA 85 Acre Tributary Area Soil Report & CN Values– C1

NOAA 14 Precipitation Depths – D

FEMA Firmette – E

Off-Site Watershed Tributary Area – F

85 Acre Tributary Watershed and Site – G

Post-Developed Hydrology Plan – H

Section A-A and Section B-B – I

Channel and Pipe Calculations - J

Weir Coefficient Nomagraph - K

Latitude	Longitude
34.602008	-117.158187

DATE:	**EXHIBIT A** **LOCATION MAP** **JOHNSON ROAD and NAVAJO ROAD INDUSTRIAL PROJECT** **TOWN of APPLE VALLY, CA** **APN: 0463-213-26, -27 & -28**	RED BRICK SOLUTION CONSULTING ENGINEERS & ARCHITECTS
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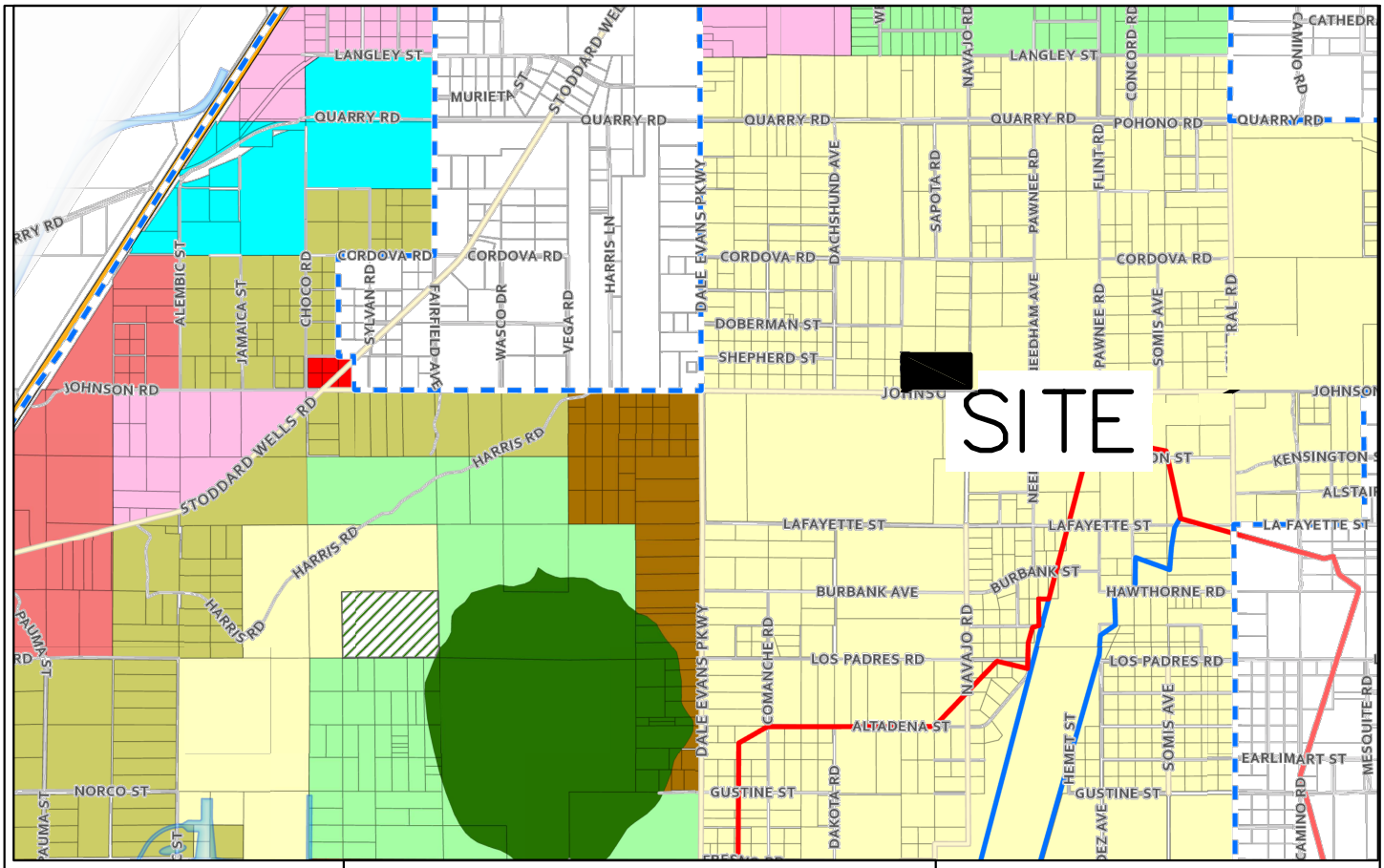
SCALE: NTS		



Legend

Zoning

- (R-VLD) Very Low Density Residential (1du/5 or more gross acres)
- (R-A) Residential Agriculture (1du/2.5 gross acres)
- (R-LD) Low Density Residential (1 du/2.5 to 5 gross acres)
- (R-E) Estate Residential (1 du/1 to 2.5 gross acres)
- (RE-3/4) Estate Residential 3/4 (1 du/0.75 net acre)
- (R-EQ) Equestrian Residential (1 du/0.4 to 0.9 net acre)
- (R-SF) Single Family Residential (1du/0.4 to 0.9 net acre)
- (R-M) Multi-Family Residential (2 to 20 du/net acre)
- (MHP) Mobile Home Park
- (PRD) Planned Residential Development
- (C-G) General Commercial
- (C-V) Village Commercial
- (C-S) Service Commercial
- (O-P) Office Professional
- (C-R) Regional Commercial
- (I-P) Planned Industrial
- (I-RE) Resource Extraction
- (P-F) Public Facilities
- (OS-C) Open Space Conservation
- (OS-R) Open Space Recreation
- (M-U) Mixed Use
- (SP) Specific Plan

- Town Boundary
- Sphere of Influence
- Parcels
- (A-1) Airport Overlay District
- (A-2) Airport Overlay District
- (F-H) Flood Hazard Overlay District
- (FH-L) Flood Hazard Lake Overlay District
- High Desert Corridor (Future)

Printed: 12/17/2021
Brandon Cales, CGCIO, GISP
Dept. of Innovation and Technology

DATE:	
DRAWN BY:	**DWL**
CHECKED BY:	**DWL**
SCALE:	**NTS**

EXHIBIT B
LAND USE MAP
JOHNSON ROAD and NAVAJO ROAD INDUSTRIAL PROJECT
TOWN of APPLE VALLY, CA
APN: 0463-213-26, -27 & -28

RED BRICK SOLUTION
CONSULTING ENGINEERS & ARCHITECTS

United States Department of Agriculture

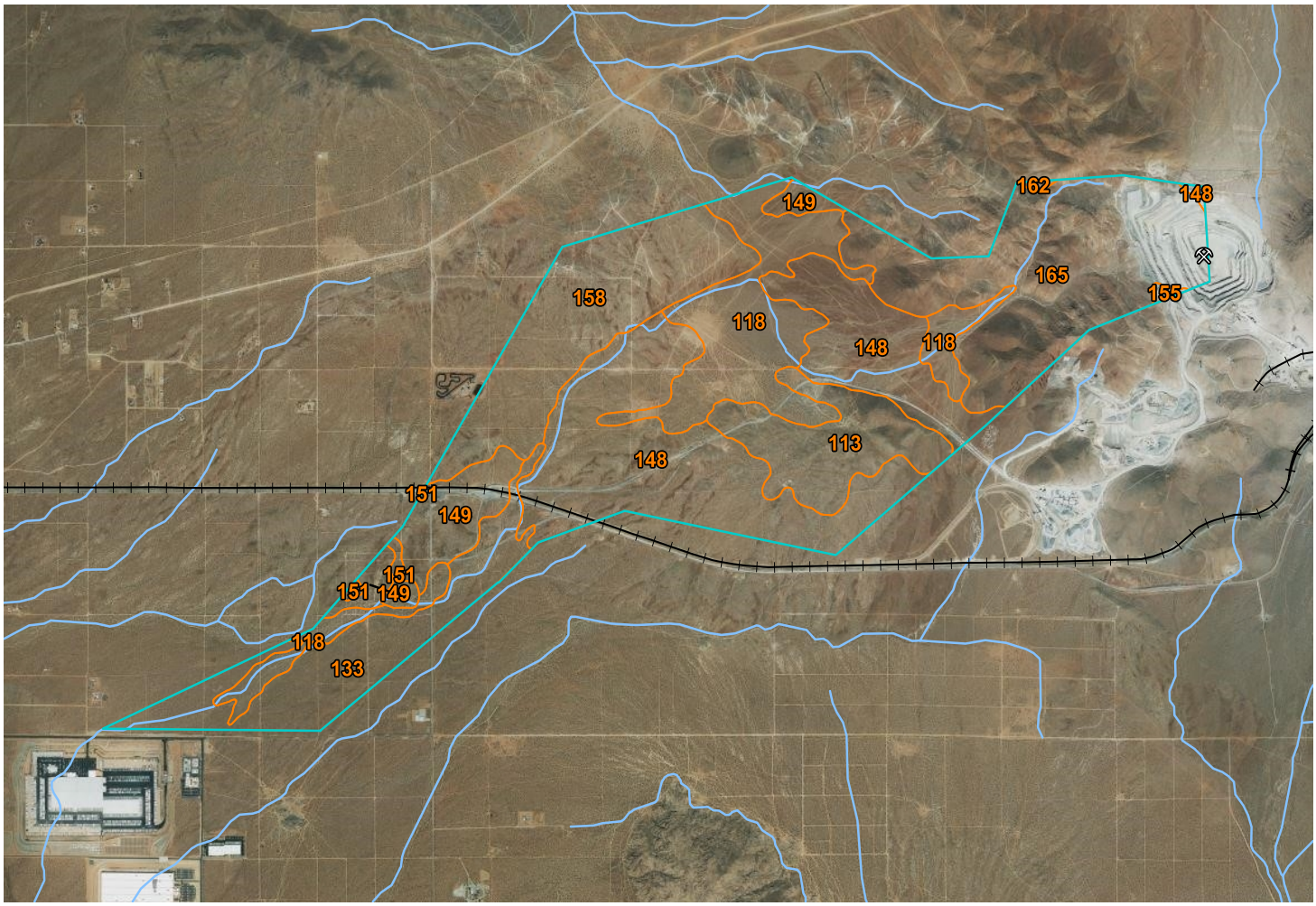
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for San Bernardino County, California, Mojave River Area

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
113 SOIL GROUP A	CAJON SAND, 2 TO 9 PERCENT SLOPES	192.8	7.7%
118 SOIL GROUP A	CAJON-ARIZO COMPLEX, 2 TO 15 PERCENT SLOPES*	374.3	14.9%
133 SOIL GROUP A & C	HELENDALE-BRYMAN LOAMY SANDS, 2 TO 5 PERCENT SLOPES*	259.3	10.4%
148 SOIL GROUP C	MIRAGE SANDY LOAM, 2 TO 5 PERCENT SLOPES*	663.3	26.5%
149 SOIL GROUP C	MIRAGE-JOSHUA COMPLEX, 2 TO 5 PERCENT SLOPES*	139.4	5.6%
151 SOIL GROUP D	NEBONA-CUDDEBACK COMPLEX, 2 TO 9 PERCENT SLOPES*	17.4	0.7%
155	PITS	4.4	0.2%
158 SOIL GROUP D	ROCK OUTCROP-LITHIC TORRIORTHENTS COMPLEX, 15 TO 50 PERCENT SLOPES*	348.1	13.9%
162 SOIL GROUP D	SPARKHULE-ROCK OUTCROP COMPLEX, 15 TO 50 PERCENT SLOPES*	2.4	0.1%
165 SOIL GROUP D	TRIGGER-SPARKHULE-ROCK OUTCROP ASSOCIATION, STEEP*	502.8	20.1%
Totals for Area of Interest		**2,504.4**	**100.0%**



July 10, 2022

San Bernardino County, California, Mojave River Area

113—CAJON SAND, 2 TO 9 PERCENT SLOPES

Map Unit Setting

National map unit symbol: hkrk
Elevation: 1,800 to 3,500 feet
Mean annual precipitation: 3 to 6 inches
Mean annual air temperature: 59 to 68 degrees F
Frost-free period: 180 to 290 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cajon and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cajon

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Typical profile

A - 0 to 6 inches: sand
C1 - 6 to 25 inches: sand
C2 - 25 to 60 inches: gravelly sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R030XF012CA - Sandy
Hydric soil rating: No

Minor Components

Cajon, gravelly surface

Percent of map unit: 5 percent

Landform: Alluvial fans

Helendale
Percent of map unit: 5 percent
Landform: Alluvial fans
Hydric soil rating: No

Kimberlina
Percent of map unit: 5 percent
Landform: Alluvial fans
Hydric soil rating: No

118—CAJON-ARIZO COMPLEX, 2 TO 15 PERCENT SLOPES*

Map Unit Setting
National map unit symbol: hkrq
Elevation: 2,800 to 3,300 feet
Mean annual precipitation: 3 to 6 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 180 to 290 days
Farmland classification: Not prime farmland

Map Unit Composition
Cajon, gravelly surface, and similar soils: 55 percent
Arizo and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cajon, Gravelly Surface

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile
H1 - 0 to 6 inches: gravelly sand
H2 - 6 to 60 inches: gravelly sand

Properties and qualities
Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None

Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R030XF028CA - COBBLY SANDY
Hydric soil rating: No

Description of Arizo

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile

H1 - 0 to 6 inches: gravelly loamy sand
H2 - 6 to 60 inches: extremely gravelly loamy coarse sand

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: NoneOccasional
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: R030XF025CA - GRAVELLY COARSE LOAMY
Hydric soil rating: No

Minor Components

Helendale

Percent of map unit: 4 percent
Hydric soil rating: No

Bryman

Percent of map unit: 4 percent
Hydric soil rating: No

Joshua

Percent of map unit: 4 percent
Hydric soil rating: No

Cajon, clayey substratum
Percent of map unit: 3 percent

133—HELENDALE-BRYMAN LOAMY SANDS, 2 TO 5 PERCENT SLOPES*

Map Unit Setting
National map unit symbol: hks6
Elevation: 2,500 to 4,000 feet
Mean annual precipitation: 3 to 6 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 180 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Helendale and similar soils: 50 percent
Bryman and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Helendale

Setting
Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile
H1 - 0 to 6 inches: loamy sand
H2 - 6 to 30 inches: sandy loam
H3 - 30 to 66 inches: sandy loam
H4 - 66 to 99 inches: loamy sand

Properties and qualities
Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R030XF012CA - Sandy
Hydric soil rating: No

Description of Bryman

Setting

Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile

H1 - 0 to 8 inches: loamy sand
H2 - 8 to 12 inches: sandy loam
H3 - 12 to 44 inches: sandy clay loam
H4 - 44 to 60 inches: loamy sand

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R030XF012CA - Sandy
Hydric soil rating: No

Minor Components

Cajon

Percent of map unit: 5 percent
Hydric soil rating: No

Mohave variant

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed soils

Percent of map unit: 5 percent
Hydric soil rating: No

148—MIRAGE SANDY LOAM, 2 TO 5 PERCENT SLOPES*

Map Unit Setting

National map unit symbol: hksp
Elevation: 2,600 to 3,400 feet
Mean annual precipitation: 3 to 5 inches
Mean annual air temperature: 63 to 66 degrees F
Frost-free period: 200 to 290 days
Farmland classification: Not prime farmland

Map Unit Composition

Mirage and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mirage

Setting

Landform: Fan remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile

H1 - 0 to 5 inches: sandy loam
H2 - 5 to 21 inches: gravelly sandy clay loam
H3 - 21 to 39 inches: gravelly sandy loam
H4 - 39 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Strongly saline (16.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R030XG024CA - DESERT PAVEMENT

Hydric soil rating: No

Minor Components

Nebona

Percent of map unit: 5 percent
Hydric soil rating: No

Cuddeback

Percent of map unit: 5 percent
Hydric soil rating: No

Mirage

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed soils

Percent of map unit: 1 percent
Hydric soil rating: No

149—MIRAGE-JOSHUA COMPLEX, 2 TO 5 PERCENT SLOPES*

Map Unit Setting

National map unit symbol: hksq
Elevation: 2,600 to 3,400 feet
Mean annual precipitation: 3 to 5 inches
Mean annual air temperature: 63 to 66 degrees F
Frost-free period: 200 to 290 days
Farmland classification: Not prime farmland

Map Unit Composition

Mirage and similar soils: 50 percent
Joshua and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mirage

Setting

Landform: Fan remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile

H1 - 0 to 5 inches: sandy loam
H2 - 5 to 21 inches: gravelly sandy clay loam
H3 - 21 to 39 inches: gravelly sandy loam
H4 - 39 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Strongly saline (16.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R030XG024CA - DESERT PAVEMENT
Hydric soil rating: No

Description of Joshua

Setting

Landform: Fan remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Typical profile

H1 - 0 to 3 inches: loam
H2 - 3 to 20 inches: gravelly sandy clay loam
H3 - 20 to 55 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Slightly saline to strongly saline (4.0 to 16.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R030XG024CA - DESERT PAVEMENT
Hydric soil rating: No

Minor Components

Unnamed soils

Percent of map unit: 10 percent
Hydric soil rating: No

Nebona

Percent of map unit: 5 percent
Hydric soil rating: No

Cuddeback

Percent of map unit: 5 percent
Hydric soil rating: No

151—NEBONA-CUDDEBACK COMPLEX, 2 TO 9 PERCENT SLOPES*

Map Unit Setting

National map unit symbol: hkss
Elevation: 1,800 to 3,400 feet
Mean annual precipitation: 3 to 5 inches
Mean annual air temperature: 63 to 66 degrees F
Frost-free period: 200 to 290 days
Farmland classification: Not prime farmland

Map Unit Composition

Nebona and similar soils: 60 percent
Cuddeback and similar soils: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nebona

Setting

Landform: Fan remnants
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Typical profile

H1 - 0 to 2 inches: sandy loam
H2 - 2 to 8 inches: fine sandy loam
H3 - 8 to 12 inches: indurated
H4 - 12 to 65 inches: stratified gravelly sand to loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: 6 to 14 inches to duripan
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Slightly saline to strongly saline (4.0 to 16.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 0.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R030XF030CA - DESERT PAVEMENT
Hydric soil rating: No

Description of Cuddeback

Setting

Landform: Inset fans
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Typical profile

H1 - 0 to 3 inches: sandy loam
H2 - 3 to 6 inches: sandy loam
H3 - 6 to 17 inches: gravelly sandy clay loam
H4 - 17 to 34 inches: gravelly sandy loam
H5 - 34 to 38 inches: indurated

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R030XG024CA - DESERT PAVEMENT
Hydric soil rating: No

Minor Components

Unnamed soils

Percent of map unit: 19 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 1 percent
Landform: Playas
Hydric soil rating: Yes

155—PITS

Map Unit Composition
Pits: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pits

Setting
Landform: Stream terraces, alluvial fans
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Mountainflank, side slope, tread
Down-slope shape: Linear
Across-slope shape: Linear

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Arizo
Percent of map unit: 5 percent
Hydric soil rating: No

Cajon
Percent of map unit: 3 percent
Hydric soil rating: No

Yermo
Percent of map unit: 2 percent
Hydric soil rating: No

Riverwash
Percent of map unit: 2 percent
Landform: Channels
Hydric soil rating: Yes

Trigger
Percent of map unit: 1 percent
Hydric soil rating: No

Sparkhule
Percent of map unit: 1 percent

Hydric soil rating: No

Rock outcrop
Percent of map unit: 1 percent
Hydric soil rating: No

158—ROCK OUTCROP-LITHIC TORRIORTHENTS COMPLEX, 15 TO 50 PERCENT SLOPES*

Map Unit Setting
National map unit symbol: hkt0
Elevation: 650 to 9,000 feet
Mean annual precipitation: 3 to 5 inches
Mean annual air temperature: 63 to 66 degrees F
Frost-free period: 200 to 290 days
Farmland classification: Not prime farmland

Map Unit Composition
Rock outcrop: 60 percent
Lithic torriorthents and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Setting
Landform: Mountains
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Concave

Typical profile
H1 - 0 to 10 inches: unweathered bedrock

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Lithic Torriorthents

Setting
Landform: Mountains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from granite

Typical profile
H1 - 0 to 15 inches: variable
H2 - 15 to 29 inches: bedrock

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Excessively drained
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydric soil rating: No

Minor Components

Sparkhule

Percent of map unit: 4 percent
Hydric soil rating: No

Trigger

Percent of map unit: 3 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 3 percent
Hydric soil rating: No

162—SPARKHULE-ROCK OUTCROP COMPLEX, 15 TO 50 PERCENT SLOPES*

Map Unit Setting

National map unit symbol: hkt4
Elevation: 650 to 4,500 feet
Mean annual precipitation: 3 to 6 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 180 to 290 days
Farmland classification: Not prime farmland

Map Unit Composition

Sparkhule and similar soils: 60 percent
Rock outcrop: 35 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sparkhule

Setting

Landform: Mountains

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Colluvium derived from and/or residuum weathered from dacite

Typical profile

H1 - 0 to 2 inches: gravelly sandy loam
H2 - 2 to 18 inches: gravelly sandy clay loam
H3 - 18 to 28 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: 14 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R030XF033CA - GRAVELLY LOAM
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Concave

Typical profile

H1 - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Unnamed, sl-grscl subsoil

Percent of map unit: 5 percent
Hydric soil rating: No

165—TRIGGER-SPARKHULE-ROCK OUTCROP ASSOCIATION, STEEP*

Map Unit Setting

National map unit symbol: hkt7
Elevation: 650 to 4,500 feet
Mean annual precipitation: 3 to 5 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 180 to 290 days
Farmland classification: Not prime farmland

Map Unit Composition

Trigger and similar soils: 40 percent
Sparkhule and similar soils: 30 percent
Rock outcrop: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Trigger

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from calcareous conglomerate

Typical profile

H1 - 0 to 12 inches: gravelly sandy loam
H2 - 12 to 22 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 40 percent
Depth to restrictive feature: 10 to 18 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R030XF033CA - GRAVELLY LOAM
Hydric soil rating: No

Description of Sparkhule

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Colluvium derived from and/or residuum weathered from dacite

Typical profile

H1 - 0 to 2 inches: gravelly sandy loam
H2 - 2 to 18 inches: gravelly sandy clay loam
H3 - 18 to 28 inches: unweathered bedrock

Properties and qualities

Slope: 20 to 30 percent
Depth to restrictive feature: 14 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R030XF033CA - GRAVELLY LOAM
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave

Typical profile

H1 - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 20 to 40 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

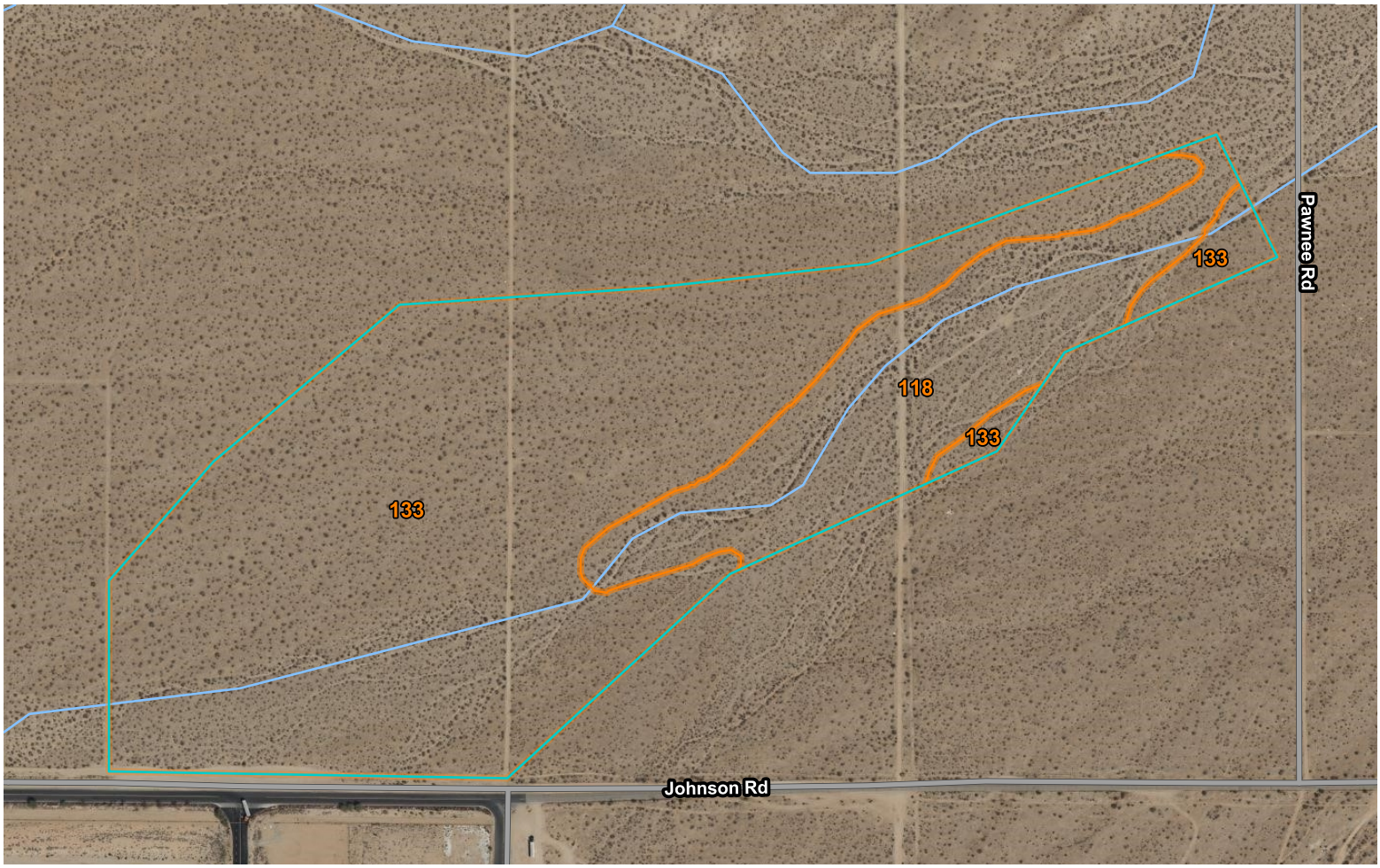
A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for San Bernardino County, California, Mojave River Area

2233 Soil Map Detail

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
118 Group A	CAJON-ARIZO COMPLEX, 2 TO 15 PERCENT SLOPES*	19.7	22.7%
133 Group A & C	HELENDALE-BRYMAN LOAMY SANDS, 2 TO 5 PERCENT SLOPES*	67.3	77.3%
Totals for Area of Interest		**87.0**	**100.0%**



December 14, 2023

San Bernardino County, California, Mojave River Area

118—CAJON-ARIZO COMPLEX, 2 TO 15 PERCENT SLOPES*

Map Unit Setting

National map unit symbol: hkrq
Elevation: 2,800 to 3,300 feet
Mean annual precipitation: 3 to 6 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 180 to 290 days
Farmland classification: Not prime farmland

Map Unit Composition

Cajon, gravelly surface, and similar soils: 55 percent
Arizo and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cajon, Gravelly Surface

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile

H1 - 0 to 6 inches: gravelly sand
H2 - 6 to 60 inches: gravelly sand

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R030XF028CA - COBBLY SANDY
Hydric soil rating: No

Description of Arizo

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile

H1 - 0 to 6 inches: gravelly loamy sand
H2 - 6 to 60 inches: extremely gravelly loamy coarse sand

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: R030XF025CA - GRAVELLY COARSE LOAMY
Hydric soil rating: No

Minor Components

Helendale

Percent of map unit: 4 percent
Hydric soil rating: No

Joshua

Percent of map unit: 4 percent
Hydric soil rating: No

Bryman

Percent of map unit: 4 percent
Hydric soil rating: No

Cajon, clayey substratum

Percent of map unit: 3 percent

133—HELENDALE-BRYMAN LOAMY SANDS, 2 TO 5 PERCENT SLOPES*

Map Unit Setting

National map unit symbol: hks6

Elevation: 2,500 to 4,000 feet
Mean annual precipitation: 3 to 6 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 180 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Helendale and similar soils: 50 percent
Bryman and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Helendale

Setting

Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile

H1 - 0 to 6 inches: loamy sand
H2 - 6 to 30 inches: sandy loam
H3 - 30 to 66 inches: sandy loam
H4 - 66 to 99 inches: loamy sand

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R030XF012CA - Sandy
Hydric soil rating: No

Description of Bryman

Setting

Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile

H1 - 0 to 8 inches: loamy sand
H2 - 8 to 12 inches: sandy loam
H3 - 12 to 44 inches: sandy clay loam
H4 - 44 to 60 inches: loamy sand

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R030XF012CA - Sandy
Hydric soil rating: No

Minor Components

Cajon

Percent of map unit: 5 percent
Hydric soil rating: No

Mohave variant

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed soils

Percent of map unit: 5 percent
Hydric soil rating: No

Curve (1) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	71	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent.)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		77	86	91	94

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

CURVE NUMBERS FOR PERVIOUS AREAS

Figure C-3 (1 of 2)

EXHIBIT D1 - PRECIPITATION DEPTHS - LOWER AREA

Location name: Apple Valley, California, USA*
Latitude: 34.6026°, Longitude: -117.1922°
Elevation: 3077.44 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.082** (0.068-0.101)	**0.116** (0.095-0.142)	**0.162** (0.133-0.200)	**0.203** (0.165-0.252)	**0.261** (0.206-0.335)	**0.309** (0.239-0.405)	**0.360** (0.272-0.483)	**0.416** (0.305-0.574)	**0.497** (0.350-0.713)	**0.564** (0.384-0.837)
10-min	**0.118** (0.097-0.144)	**0.166** (0.136-0.203)	**0.233** (0.191-0.287)	**0.291** (0.237-0.361)	**0.374** (0.295-0.480)	**0.443** (0.342-0.580)	**0.517** (0.389-0.692)	**0.597** (0.438-0.822)	**0.712** (0.501-1.02)	**0.808** (0.550-1.20)
15-min	**0.142** (0.117-0.175)	**0.200** (0.165-0.246)	**0.281** (0.231-0.347)	**0.351** (0.286-0.436)	**0.453** (0.357-0.580)	**0.536** (0.414-0.701)	**0.625** (0.471-0.837)	**0.722** (0.529-0.994)	**0.861** (0.606-1.24)	**0.977** (0.665-1.45)
30-min	**0.195** (0.160-0.239)	**0.274** (0.226-0.337)	**0.385** (0.316-0.474)	**0.481** (0.391-0.597)	**0.620** (0.488-0.794)	**0.733** (0.566-0.959)	**0.855** (0.644-1.15)	**0.988** (0.724-1.36)	**1.18** (0.830-1.69)	**1.34** (0.910-1.98)
60-min	**0.245** (0.202-0.300)	**0.345** (0.284-0.423)	**0.484** (0.397-0.596)	**0.605** (0.492-0.751)	**0.779** (0.614-0.999)	**0.922** (0.712-1.21)	**1.08** (0.810-1.44)	**1.24** (0.911-1.71)	**1.48** (1.04-2.13)	**1.68** (1.14-2.50)
2-hr	**0.348** (0.286-0.426)	**0.471** (0.387-0.578)	**0.641** (0.526-0.789)	**0.786** (0.640-0.976)	**0.995** (0.784-1.28)	**1.17** (0.899-1.52)	**1.34** (1.01-1.80)	**1.54** (1.13-2.12)	**1.81** (1.28-2.60)	**2.04** (1.39-3.03)
3-hr	**0.422** (0.348-0.517)	**0.564** (0.464-0.692)	**0.759** (0.623-0.934)	**0.925** (0.753-1.15)	**1.16** (0.915-1.49)	**1.35** (1.04-1.77)	**1.55** (1.17-2.08)	**1.77** (1.30-2.44)	**2.08** (1.46-2.98)	**2.32** (1.58-3.45)
6-hr	**0.575** (0.474-0.705)	**0.760** (0.625-0.933)	**1.01** (0.830-1.25)	**1.22** (0.996-1.52)	**1.52** (1.20-1.95)	**1.76** (1.36-2.30)	**2.01** (1.52-2.70)	**2.28** (1.67-3.14)	**2.65** (1.87-3.80)	**2.95** (2.01-4.38)
12-hr	**0.740** (0.609-0.907)	**0.981** (0.807-1.20)	**1.31** (1.07-1.61)	**1.58** (1.28-1.96)	**1.96** (1.54-2.51)	**2.25** (1.74-2.95)	**2.56** (1.93-3.44)	**2.89** (2.12-3.98)	**3.34** (2.35-4.80)	**3.70** (2.52-5.50)
24-hr	**0.972** (0.863-1.12)	**1.31** (1.16-1.50)	**1.75** (1.55-2.02)	**2.12** (1.85-2.46)	**2.62** (2.22-3.16)	**3.02** (2.51-3.71)	**3.43** (2.78-4.32)	**3.85** (3.04-4.99)	**4.44** (3.36-5.99)	**4.90** (3.58-6.85)
2-day	**1.15** (1.02-1.33)	**1.57** (1.39-1.81)	**2.13** (1.88-2.46)	**2.59** (2.27-3.02)	**3.22** (2.73-3.87)	**3.70** (3.07-4.55)	**4.20** (3.41-5.29)	**4.72** (3.72-6.12)	**5.43** (4.11-7.33)	**5.99** (4.37-8.37)
3-day	**1.25** (1.11-1.44)	**1.73** (1.53-1.99)	**2.36** (2.08-2.72)	**2.87** (2.52-3.34)	**3.57** (3.03-4.30)	**4.12** (3.42-5.06)	**4.67** (3.79-5.89)	**5.25** (4.14-6.80)	**6.04** (4.57-8.16)	**6.66** (4.87-9.31)
4-day	**1.33** (1.18-1.53)	**1.84** (1.63-2.12)	**2.51** (2.22-2.90)	**3.06** (2.68-3.57)	**3.82** (3.23-4.59)	**4.40** (3.65-5.40)	**4.99** (4.04-6.28)	**5.61** (4.42-7.26)	**6.45** (4.87-8.70)	**7.11** (5.19-9.93)
7-day	**1.45** (1.28-1.67)	**1.99** (1.76-2.29)	**2.71** (2.39-3.13)	**3.30** (2.89-3.84)	**4.10** (3.48-4.94)	**4.73** (3.93-5.82)	**5.38** (4.36-6.77)	**6.04** (4.76-7.83)	**6.96** (5.26-9.40)	**7.68** (5.61-10.7)
10-day	**1.53** (1.36-1.76)	**2.09** (1.85-2.41)	**2.84** (2.51-3.28)	**3.46** (3.03-4.03)	**4.32** (3.66-5.20)	**4.98** (4.14-6.12)	**5.67** (4.59-7.14)	**6.38** (5.03-8.26)	**7.36** (5.56-9.94)	**8.13** (5.94-11.4)
20-day	**1.75** (1.55-2.02)	**2.40** (2.13-2.77)	**3.28** (2.90-3.79)	**4.01** (3.52-4.67)	**5.03** (4.26-6.06)	**5.83** (4.84-7.17)	**6.66** (5.40-8.39)	**7.53** (5.93-9.75)	**8.73** (6.60-11.8)	**9.68** (7.07-13.5)
30-day	**1.98** (1.76-2.28)	**2.73** (2.41-3.14)	**3.74** (3.30-4.32)	**4.59** (4.02-5.34)	**5.78** (4.90-6.96)	**6.72** (5.58-8.27)	**7.71** (6.24-9.71)	**8.74** (6.89-11.3)	**10.2** (7.69-13.7)	**11.3** (8.27-15.8)
45-day	**2.33** (2.07-2.68)	**3.22** (2.85-3.71)	**4.43** (3.92-5.12)	**5.46** (4.79-6.36)	**6.93** (5.87-8.34)	**8.10** (6.72-9.96)	**9.32** (7.56-11.7)	**10.6** (8.37-13.8)	**12.4** (9.41-16.8)	**13.9** (10.2-19.4)
60-day	**2.55** (2.26-2.94)	**3.51** (3.11-4.05)	**4.85** (4.28-5.60)	**5.98** (5.24-6.97)	**7.61** (6.45-9.16)	**8.93** (7.41-11.0)	**10.3** (8.36-13.0)	**11.8** (9.30-15.3)	**13.9** (10.5-18.8)	**15.6** (11.4-21.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

EXHIBIT D2 - PRECIPITATION DEPTHS - MIDDLE AREA

NOAA Atlas 14, Volume 6, Version 2
Location name: Apple Valley, California, USA*
Latitude: 34.6228°, Longitude: -117.1403°
Elevation: 3422 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.082** (0.067-0.101)	**0.116** (0.095-0.142)	**0.162** (0.133-0.200)	**0.203** (0.165-0.252)	**0.261** (0.205-0.335)	**0.309** (0.238-0.404)	**0.360** (0.271-0.482)	**0.415** (0.304-0.572)	**0.495** (0.348-0.710)	**0.561** (0.382-0.832)
10-min	**0.117** (0.097-0.144)	**0.166** (0.136-0.204)	**0.233** (0.191-0.287)	**0.291** (0.236-0.361)	**0.374** (0.295-0.480)	**0.442** (0.341-0.579)	**0.515** (0.388-0.691)	**0.595** (0.436-0.820)	**0.709** (0.499-1.02)	**0.804** (0.547-1.19)
15-min	**0.142** (0.117-0.174)	**0.200** (0.165-0.246)	**0.281** (0.231-0.347)	**0.351** (0.286-0.436)	**0.452** (0.356-0.580)	**0.535** (0.413-0.700)	**0.623** (0.470-0.836)	**0.719** (0.527-0.991)	**0.858** (0.604-1.23)	**0.972** (0.661-1.44)
30-min	**0.196** (0.162-0.241)	**0.277** (0.228-0.340)	**0.389** (0.319-0.480)	**0.486** (0.395-0.603)	**0.626** (0.493-0.802)	**0.740** (0.571-0.968)	**0.862** (0.649-1.16)	**0.995** (0.729-1.37)	**1.19** (0.835-1.70)	**1.34** (0.915-2.00)
60-min	**0.253** (0.209-0.311)	**0.357** (0.294-0.439)	**0.502** (0.412-0.619)	**0.627** (0.510-0.778)	**0.807** (0.635-1.03)	**0.954** (0.736-1.25)	**1.11** (0.838-1.49)	**1.28** (0.940-1.77)	**1.53** (1.08-2.20)	**1.73** (1.18-2.57)
2-hr	**0.357** (0.294-0.438)	**0.484** (0.398-0.595)	**0.659** (0.541-0.812)	**0.809** (0.659-1.00)	**1.02** (0.807-1.31)	**1.20** (0.925-1.57)	**1.39** (1.04-1.86)	**1.59** (1.16-2.18)	**1.87** (1.32-2.68)	**2.10** (1.43-3.12)
3-hr	**0.433** (0.356-0.531)	**0.578** (0.476-0.711)	**0.779** (0.639-0.960)	**0.950** (0.773-1.18)	**1.19** (0.940-1.53)	**1.39** (1.07-1.82)	**1.60** (1.21-2.15)	**1.82** (1.34-2.51)	**2.14** (1.51-3.07)	**2.40** (1.63-3.56)
6-hr	**0.583** (0.480-0.715)	**0.771** (0.634-0.947)	**1.03** (0.842-1.27)	**1.24** (1.01-1.55)	**1.55** (1.22-1.99)	**1.80** (1.39-2.35)	**2.06** (1.55-2.76)	**2.33** (1.71-3.21)	**2.72** (1.91-3.90)	**3.03** (2.06-4.50)
12-hr	**0.740** (0.610-0.909)	**0.984** (0.809-1.21)	**1.31** (1.08-1.62)	**1.59** (1.29-1.97)	**1.97** (1.56-2.53)	**2.28** (1.76-2.99)	**2.60** (1.96-3.49)	**2.94** (2.15-4.05)	**3.41** (2.40-4.89)	**3.79** (2.58-5.62)
24-hr	**0.969** (0.859-1.12)	**1.30** (1.16-1.50)	**1.75** (1.55-2.02)	**2.13** (1.86-2.47)	**2.64** (2.24-3.18)	**3.05** (2.53-3.75)	**3.47** (2.81-4.37)	**3.91** (3.08-5.06)	**4.52** (3.42-6.10)	**5.01** (3.66-6.99)
2-day	**1.14** (1.01-1.32)	**1.56** (1.38-1.80)	**2.12** (1.87-2.44)	**2.58** (2.26-3.00)	**3.21** (2.72-3.86)	**3.70** (3.07-4.55)	**4.21** (3.41-5.31)	**4.75** (3.74-6.15)	**5.48** (4.15-7.40)	**6.07** (4.43-8.48)
3-day	**1.24** (1.10-1.43)	**1.71** (1.51-1.97)	**2.33** (2.06-2.69)	**2.84** (2.49-3.31)	**3.54** (3.00-4.26)	**4.09** (3.40-5.03)	**4.65** (3.77-5.86)	**5.24** (4.13-6.79)	**6.06** (4.58-8.18)	**6.70** (4.89-9.36)
4-day	**1.32** (1.17-1.51)	**1.82** (1.61-2.09)	**2.48** (2.19-2.86)	**3.02** (2.65-3.52)	**3.77** (3.19-4.54)	**4.35** (3.61-5.35)	**4.95** (4.01-6.23)	**5.57** (4.39-7.22)	**6.43** (4.86-8.68)	**7.11** (5.19-9.94)
7-day	**1.44** (1.28-1.66)	**1.97** (1.75-2.27)	**2.68** (2.36-3.09)	**3.26** (2.85-3.79)	**4.05** (3.44-4.88)	**4.67** (3.88-5.74)	**5.31** (4.30-6.69)	**5.98** (4.71-7.74)	**6.90** (5.21-9.31)	**7.63** (5.57-10.7)
10-day	**1.53** (1.35-1.76)	**2.08** (1.85-2.40)	**2.82** (2.49-3.26)	**3.43** (3.00-3.99)	**4.26** (3.61-5.13)	**4.91** (4.08-6.04)	**5.58** (4.52-7.03)	**6.28** (4.95-8.13)	**7.25** (5.48-9.79)	**8.02** (5.85-11.2)
20-day	**1.76** (1.56-2.03)	**2.41** (2.14-2.78)	**3.27** (2.89-3.78)	**3.98** (3.49-4.64)	**4.96** (4.21-5.97)	**5.73** (4.76-7.04)	**6.52** (5.29-8.22)	**7.35** (5.79-9.52)	**8.50** (6.43-11.5)	**9.42** (6.88-13.2)
30-day	**2.00** (1.78-2.30)	**2.74** (2.43-3.16)	**3.73** (3.30-4.31)	**4.55** (3.99-5.30)	**5.69** (4.82-6.85)	**6.58** (5.47-8.09)	**7.51** (6.09-9.46)	**8.49** (6.69-11.0)	**9.84** (7.44-13.3)	**10.9** (7.98-15.3)
45-day	**2.35** (2.08-2.70)	**3.22** (2.86-3.71)	**4.40** (3.89-5.08)	**5.38** (4.72-6.27)	**6.76** (5.73-8.13)	**7.84** (6.51-9.64)	**8.98** (7.28-11.3)	**10.2** (8.02-13.2)	**11.9** (8.97-16.0)	**13.2** (9.65-18.5)
60-day	**2.59** (2.30-2.98)	**3.54** (3.14-4.08)	**4.83** (4.27-5.58)	**5.91** (5.18-6.89)	**7.44** (6.31-8.96)	**8.66** (7.19-10.6)	**9.94** (8.05-12.5)	**11.3** (8.91-14.6)	**13.2** (10.0-17.9)	**14.8** (10.8-20.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

EXHIBIT D3 - PRECIPITATION DEPTHS -UPPER AREA

NOAA Atlas 14, Volume 6, Version 2
Location name: Apple Valley, California, USA*
Latitude: 34.6312°, Longitude: -117.1163°
Elevation: 4021.78 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.083** (0.068-0.101)	**0.116** (0.096-0.143)	**0.163** (0.134-0.201)	**0.203** (0.165-0.252)	**0.261** (0.205-0.335)	**0.308** (0.238-0.404)	**0.359** (0.270-0.481)	**0.413** (0.303-0.570)	**0.492** (0.346-0.706)	**0.556** (0.379-0.826)
10-min	**0.118** (0.098-0.145)	**0.167** (0.137-0.205)	**0.234** (0.191-0.288)	**0.291** (0.237-0.362)	**0.374** (0.294-0.480)	**0.442** (0.341-0.578)	**0.514** (0.387-0.689)	**0.592** (0.434-0.816)	**0.705** (0.496-1.01)	**0.797** (0.543-1.18)
15-min	**0.143** (0.118-0.176)	**0.202** (0.166-0.248)	**0.282** (0.232-0.348)	**0.352** (0.286-0.437)	**0.452** (0.356-0.580)	**0.534** (0.412-0.700)	**0.622** (0.468-0.834)	**0.716** (0.525-0.987)	**0.852** (0.600-1.22)	**0.964** (0.656-1.43)
30-min	**0.199** (0.164-0.245)	**0.280** (0.230-0.344)	**0.393** (0.322-0.484)	**0.490** (0.398-0.608)	**0.629** (0.495-0.807)	**0.743** (0.573-0.973)	**0.865** (0.651-1.16)	**0.996** (0.730-1.37)	**1.19** (0.834-1.70)	**1.34** (0.912-1.99)
60-min	**0.260** (0.214-0.320)	**0.366** (0.301-0.450)	**0.513** (0.421-0.632)	**0.639** (0.520-0.794)	**0.822** (0.647-1.05)	**0.971** (0.749-1.27)	**1.13** (0.851-1.52)	**1.30** (0.954-1.79)	**1.55** (1.09-2.22)	**1.75** (1.19-2.60)
2-hr	**0.366** (0.301-0.449)	**0.494** (0.406-0.607)	**0.671** (0.550-0.827)	**0.822** (0.669-1.02)	**1.04** (0.818-1.33)	**1.22** (0.937-1.59)	**1.40** (1.06-1.88)	**1.60** (1.17-2.21)	**1.89** (1.33-2.71)	**2.12** (1.44-3.15)
3-hr	**0.443** (0.365-0.544)	**0.591** (0.485-0.726)	**0.793** (0.650-0.977)	**0.965** (0.785-1.20)	**1.21** (0.954-1.55)	**1.41** (1.09-1.85)	**1.62** (1.22-2.17)	**1.85** (1.35-2.54)	**2.16** (1.52-3.10)	**2.42** (1.65-3.59)
6-hr	**0.595** (0.490-0.731)	**0.785** (0.645-0.965)	**1.04** (0.855-1.29)	**1.26** (1.03-1.57)	**1.57** (1.24-2.02)	**1.82** (1.40-2.38)	**2.08** (1.57-2.79)	**2.36** (1.73-3.25)	**2.75** (1.93-3.94)	**3.06** (2.08-4.54)
12-hr	**0.752** (0.619-0.923)	**0.999** (0.821-1.23)	**1.33** (1.09-1.64)	**1.61** (1.31-2.00)	**2.01** (1.58-2.57)	**2.32** (1.79-3.03)	**2.64** (1.99-3.54)	**2.98** (2.18-4.11)	**3.46** (2.43-4.96)	**3.84** (2.61-5.69)
24-hr	**0.980** (0.869-1.13)	**1.32** (1.17-1.53)	**1.78** (1.58-2.06)	**2.17** (1.90-2.52)	**2.69** (2.28-3.24)	**3.11** (2.58-3.82)	**3.54** (2.87-4.46)	**3.99** (3.14-5.17)	**4.61** (3.49-6.23)	**5.11** (3.73-7.13)
2-day	**1.16** (1.02-1.33)	**1.58** (1.40-1.82)	**2.15** (1.90-2.48)	**2.62** (2.29-3.05)	**3.27** (2.77-3.93)	**3.77** (3.13-4.64)	**4.30** (3.48-5.41)	**4.84** (3.82-6.27)	**5.60** (4.23-7.56)	**6.20** (4.53-8.66)
3-day	**1.25** (1.11-1.44)	**1.73** (1.53-1.99)	**2.36** (2.08-2.72)	**2.88** (2.52-3.35)	**3.59** (3.05-4.33)	**4.15** (3.45-5.11)	**4.73** (3.84-5.96)	**5.34** (4.21-6.91)	**6.18** (4.67-8.34)	**6.84** (5.00-9.56)
4-day	**1.33** (1.18-1.53)	**1.83** (1.62-2.11)	**2.51** (2.21-2.89)	**3.06** (2.68-3.56)	**3.82** (3.24-4.60)	**4.42** (3.67-5.43)	**5.03** (4.08-6.34)	**5.67** (4.47-7.35)	**6.56** (4.96-8.86)	**7.26** (5.31-10.1)
7-day	**1.46** (1.29-1.67)	**2.00** (1.77-2.30)	**2.72** (2.40-3.14)	**3.31** (2.90-3.85)	**4.13** (3.50-4.97)	**4.76** (3.95-5.85)	**5.42** (4.39-6.82)	**6.10** (4.81-7.91)	**7.05** (5.33-9.52)	**7.80** (5.70-10.9)
10-day	**1.54** (1.37-1.78)	**2.11** (1.87-2.43)	**2.87** (2.53-3.31)	**3.49** (3.06-4.06)	**4.34** (3.68-5.23)	**5.01** (4.16-6.16)	**5.70** (4.62-7.18)	**6.42** (5.06-8.32)	**7.42** (5.61-10.0)	**8.21** (5.99-11.5)
20-day	**1.79** (1.59-2.06)	**2.46** (2.17-2.83)	**3.34** (2.95-3.86)	**4.07** (3.56-4.74)	**5.08** (4.30-6.11)	**5.86** (4.87-7.21)	**6.68** (5.41-8.41)	**7.53** (5.93-9.75)	**8.71** (6.58-11.8)	**9.64** (7.04-13.5)
30-day	**2.03** (1.80-2.34)	**2.80** (2.48-3.22)	**3.81** (3.37-4.40)	**4.66** (4.08-5.42)	**5.82** (4.94-7.01)	**6.74** (5.60-8.28)	**7.69** (6.23-9.68)	**8.69** (6.84-11.2)	**10.1** (7.61-13.6)	**11.2** (8.16-15.6)
45-day	**2.38** (2.12-2.74)	**3.28** (2.91-3.78)	**4.49** (3.96-5.18)	**5.49** (4.81-6.39)	**6.89** (5.84-8.30)	**8.00** (6.64-9.83)	**9.15** (7.42-11.5)	**10.4** (8.17-13.4)	**12.1** (9.13-16.3)	**13.4** (9.81-18.8)
60-day	**2.64** (2.34-3.04)	**3.62** (3.21-4.17)	**4.94** (4.36-5.70)	**6.05** (5.30-7.04)	**7.60** (6.44-9.15)	**8.84** (7.34-10.9)	**10.1** (8.21-12.8)	**11.5** (9.07-14.9)	**13.5** (10.2-18.2)	**15.0** (11.0-21.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

National Flood Hazard Layer FIRMette

EXHIBIT E - FEMA FIRMETTE

FEMA

117°11'16"W 34°36'14"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

117°10'39"W 34°35'45"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

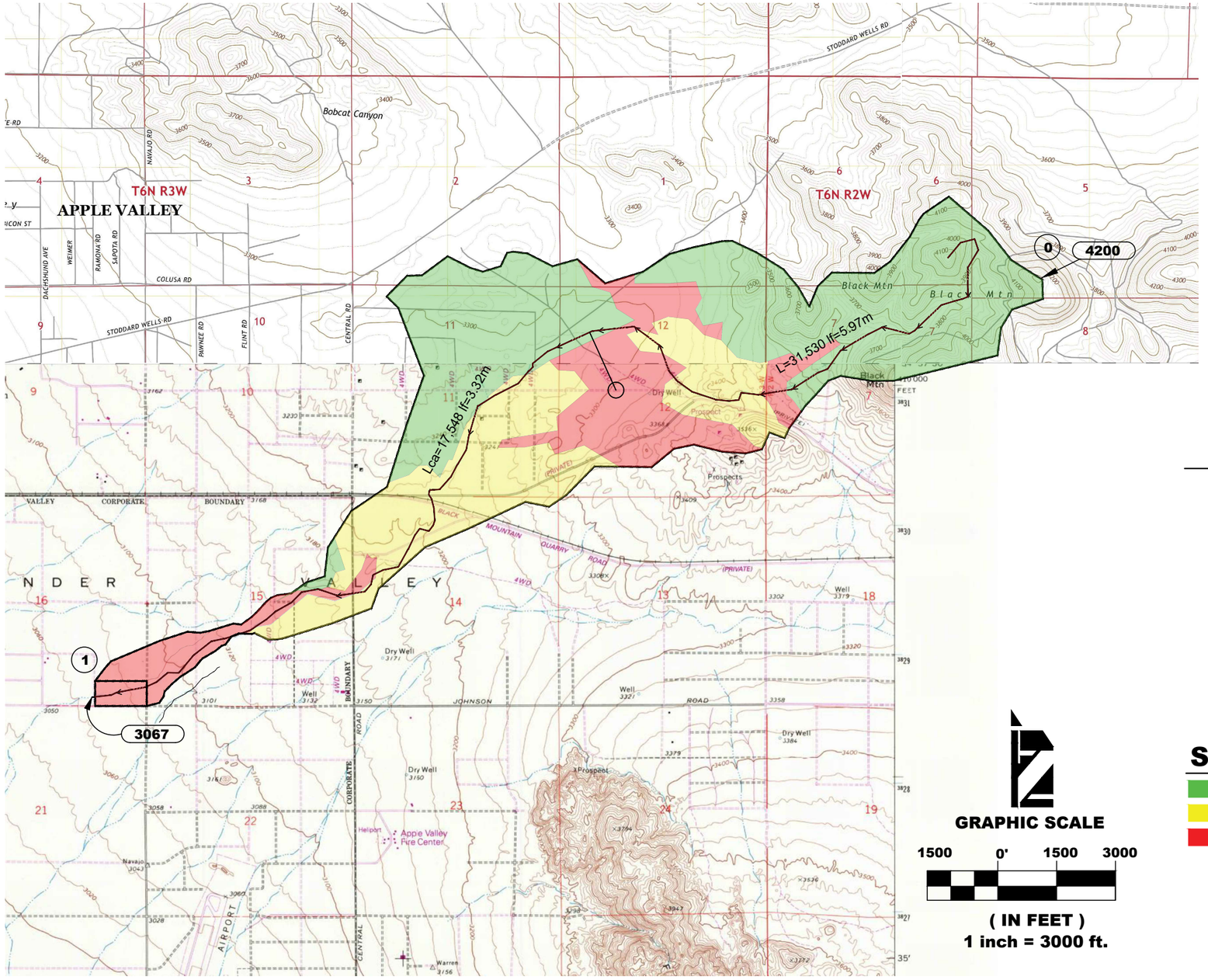
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/8/2023 at 2:55 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



LEGEND:

- TRIBUTARY DRAINAGE AREA
- SUBAREA BOUNDARY
- SUBAREA FLOWLINE
- PROPERTY LINE
- ## NODE #
- XX.XX SPOT ELEVATION
- EG EXISTING GRADE
- FG FINISH GRADE
- FS FINISH SURFACE
- FF FINISH FLOOR
- IE INVERT ELEVATION

LAG CALC AREA "A"

$1Lag = C_t * ((L*L_{ca})/s^{0.5})^m$

$C_t = 24\bar{n}$ ($\bar{n} = 0.040$)

$L = 5.97$ miles

$L_{ca} = 3.32$ miles (to the Centroid)

$S = 1133/5.79 = 189.70$ (feet/mile)

$m = 0.38$

$Lag = 0.910$

SOIL TYPES

	%AREA	OPEN BRUSH FAIR COVER AMC II CN	Ap
SOIL TYPE D	52%	83	0.9
SOIL TYPE C	28%	77	0.9
SOIL TYPE A	20%	46	0.9

Q100= 1680.56 cfs
V=433.28 AF

GRAPHIC SCALE
1500 0' 1500 3000
(IN FEET)
1 inch = 3000 ft.

HYDROLOGY ANALYSIS

PRE-DEVELOPED TRIBUTARY WATERSHED AREA

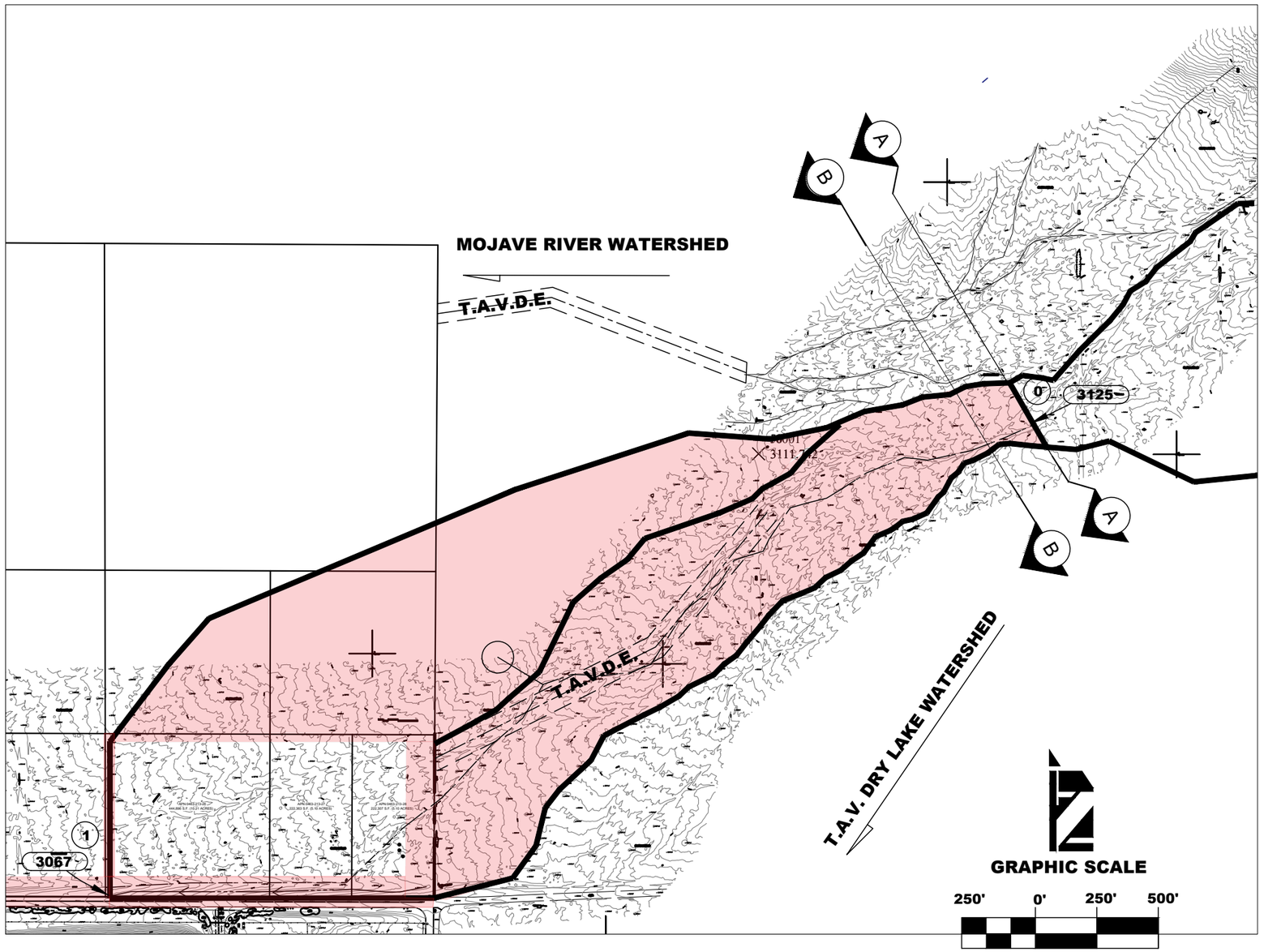
FOR:
JOHNSON ROAD
NAVAJO ROAD
INDUSTRIAL

TOWN OF APPLE VALLEY, CA

APN:
0463-213-28, 27, 26

RED BRICK SOLUTION
CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT F



GRAPHIC SCALE

250' 0' 250' 500'

(IN FEET)
1 inch = 500 ft.

LEGEND:

- TRIBUTARY DRAINAGE AREA
- SUBAREA BOUNDARY
- SUBAREA FLOWLINE
- PROPERTY LINE
- ## NODE #
- XX.XX SPOT ELEVATION
- EG EXISTING GRADE
- FG FINISH GRADE
- FS FINISH SURFACE
- FF FINISH FLOOR
- IE INVERT ELEVATION

LAG CALC AREA "A"

$1Lag = C_t * ((L * L_{ca})/s^{0.5})^m$

$C_t = 24\bar{n}$ ($\bar{n} = 0.040$)

$L = 0.856$ miles

$L_{ca} = 0.402$ miles (to the Centroid)

$S = 59/0.856 = 68.86$ (feet/mile)

$m = 0.38$

$Lag = 0.236$

PRE-DEVELOPMENT
Q100= 167.76 cfs
V=12.93 AF

POST-DEVELOPMENT
Q100= 172.26 cfs
V=14.46 AF

SOIL TYPES	OPEN BRUSH FAIR COVER AMC II CN	PRE Ap	POST Ap
59.29 ACRES SOIL TYPE A	46	0.90	0.767
26.54 ACRES SOIL TYPE C	77	0.90	0.767

HYDROLOGY STUDY

85 ACRE TRIBUTARY WATERSHED AND SITE

FOR:
ONE (1) WAREHOUSE BUILDING ON JOHNSON ROAD

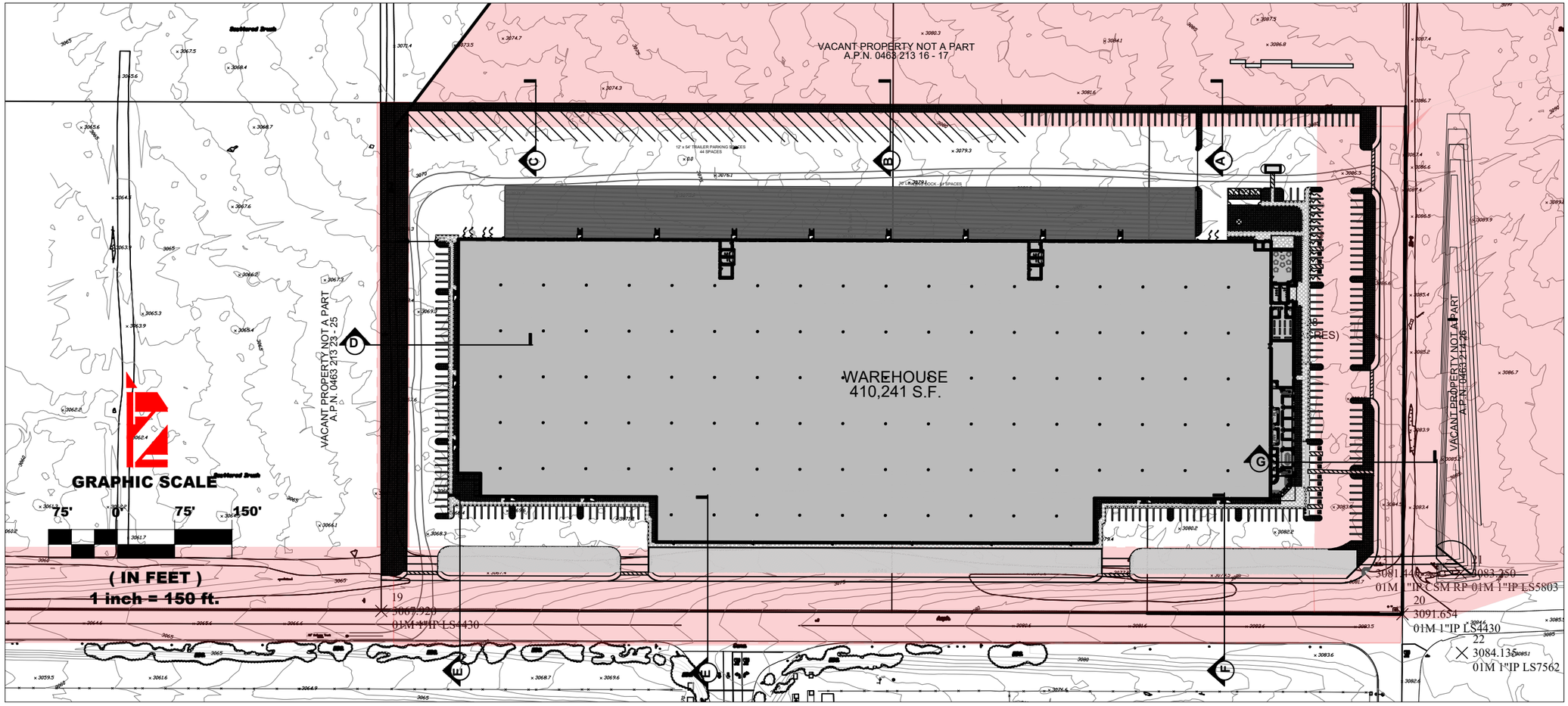
IN THE:
CITY OF APPLE VALLEY, CA

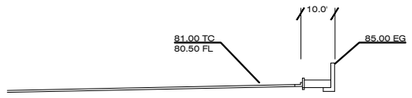
APN:
0463-213-26, 27, 28

RED BRICK SOLUTION

CONSULTING ENGINEERS & ARCHITECTS

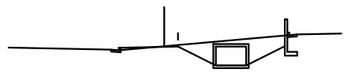
EXHIBIT G



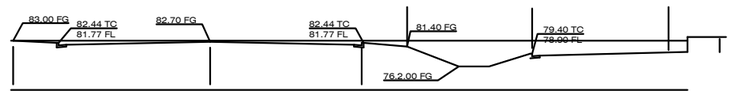


A NORTHERN PL DRAINAGE CHANNEL
SECTION A-A

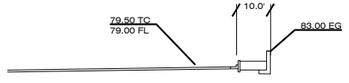
C NORTHERN PL DRAINAGE CHANNEL
SECTION C-C



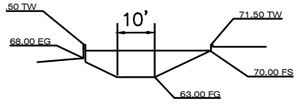
E SOUTHERN PL DRAINAGE CHANNEL
SECTION E-E



F SOUTHERN PL DRAINAGE CHANNEL
SECTION E-E



B NORTHERN PL DRAINAGE CHANNEL
SECTION B-B



D WEST PL DRAINAGE CHANNEL
SECTION D-D

G EASTERN PL DRAINAGE CHANNEL
SECTION F-F

HYDROLOGY STUDY

CHANNELIZATION OF OFF-SITE FLOWS

FOR:
ONE (1) WAREHOUSE BUILDING ON JOHNSON ROAD

IN THE:
CITY OF APPLE VALLEY, CA

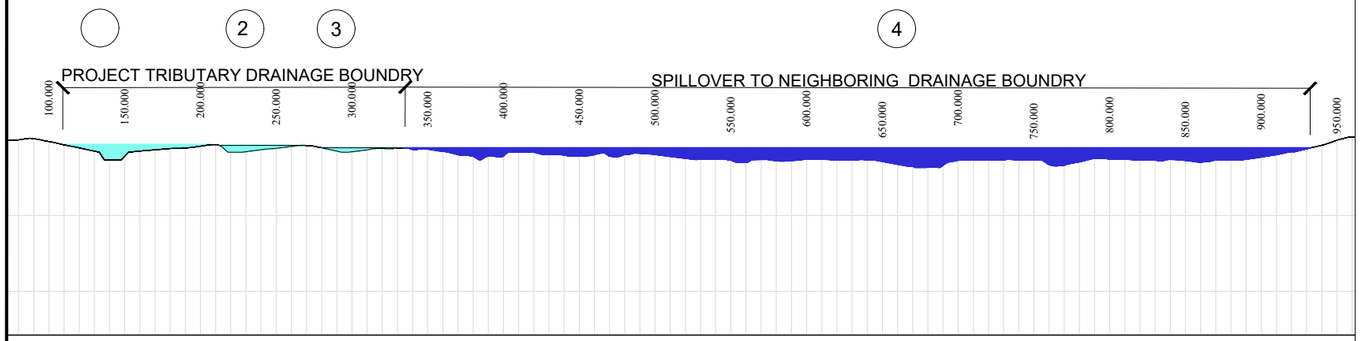
APN:
0463-213-26, 27, 28

RED BRICK SOLUTION

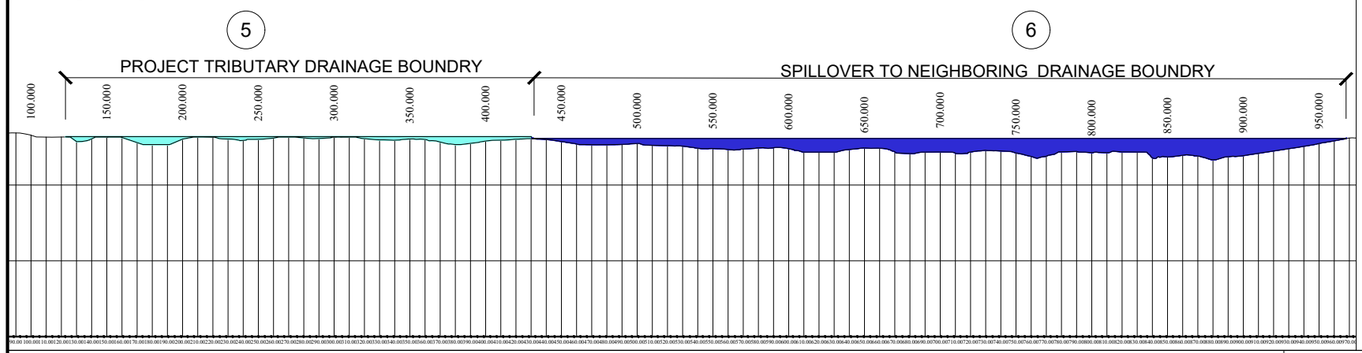
CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT H

SECTION A-A



SECTION B-B



LEGEND

PROJECT TRIBUTARY DRAINAGE BOUNDRY
Q: 521.21

SPILLOVER TO NEIGHBORING DRAINAGE BOUNDRY Q: 6339.951

LEGEND

PROJECT TRIBUTARY DRAINAGE BOUNDRY
Q: 317.27

SPILLOVER TO NEIGHBORING DRAINAGE BOUNDRY Q: 8057.505

A-A

1

AREA	=	76.02
WETTED PERIMETER	=	99.47
R= A/P	=	0.764251
SLOPE	=	0.018244
n	=	0.033
Q	=	387.1936

3

AREA	=	27.377
WETTED PERIMETER	=	54.6028
R= A/P	=	0.501385
SLOPE	=	0.01692
n	=	0.033
Q	=	101.2448

2

AREA	=	13.9037
WETTED PERIMETER	=	54.3242
R= A/P	=	0.255939
SLOPE	=	0.01692
n	=	0.033
Q	=	32.76836

4

AREA	=	817.072
WETTED PERIMETER	=	598.591
R= A/P	=	1.364992
SLOPE	=	0.019464
n	=	0.033
Q	=	6339.951

B-B

5

AREA	=	120.879
WETTED PERIMETER	=	308.0429
R= A/P	=	0.39241
SLOPE	=	0.011836
n	=	0.033
Q	=	317.2716

6

AREA	=	807.87
WETTED PERIMETER	=	538.0588
R= A/P	=	1.501453
SLOPE	=	0.028304
n	=	0.033
Q	=	8057.505

HYDROLOGY STUDY

CROSS-SECTIONS

FOR:
JOHNSON ROAD INDUSTRIAL

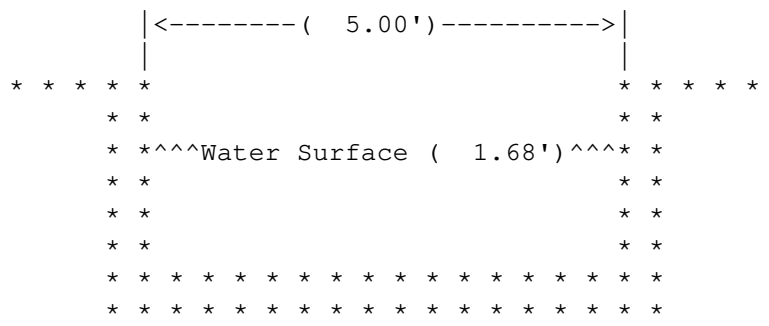
IN THE:
TOWN OF APPLE VALLEY, CA

APN:
0463-213-26,27,28

RED BRICK SOLUTION
CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT I

Joseph E. Bonadiman & Assoc., Inc.
Consulting Engineers
234 N. Arrowhead Ave.
San Bernardino, California 92408
(909)885-3806

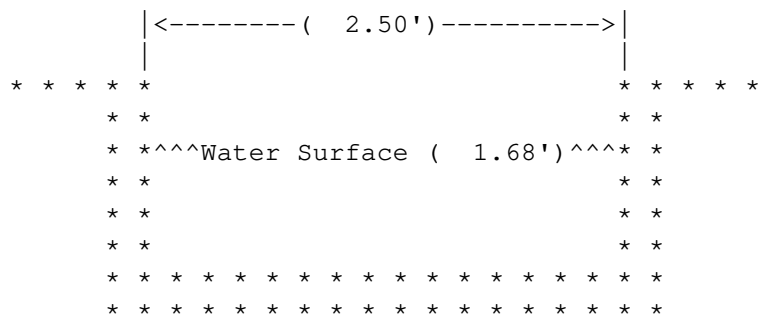


Rectangular Open Channel

Flowrate	68.000 CFS
Velocity	8.105 fps
Depth of Flow	1.678 feet
Critical Depth	1.791 feet
Total Depth	1.678 feet
Base Width	5.000 feet
Slope of Channel	0.500 %
X-Sectional Area	8.390 sq. ft.
Wetted Perimeter	8.356 feet
AR^(2/3)	8.413
Mannings 'n'	0.013

EXHIBIT J1

Joseph E. Bonadiman & Assoc., Inc.
Consulting Engineers
234 N. Arrowhead Ave.
San Bernardino, California 92408
(909)885-3806

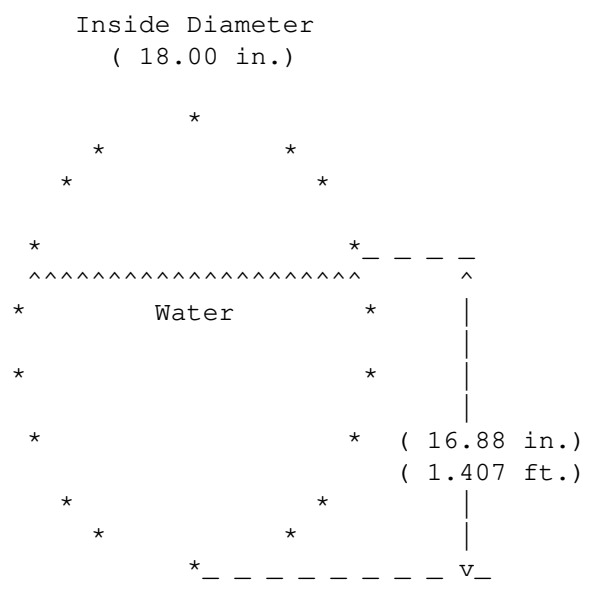


Rectangular Open Channel

Flowrate	27.188	CFS
Velocity	6.473	fps
Depth of Flow	1.680	feet
Critical Depth	1.543	feet
Total Depth	1.680	feet
Base Width	2.500	feet
Slope of Channel	0.500	%
X-Sectional Area	4.200	sq. ft.
Wetted Perimeter	5.860	feet
AR^(2/3)	3.364	
Mannings 'n'	0.013	

EXHIBIT J2

Joseph E. Bonadiman & Assoc., Inc.
Consulting Engineers
234 N. Arrowhead Ave.
San Bernardino, California 92408
(909)885-3806

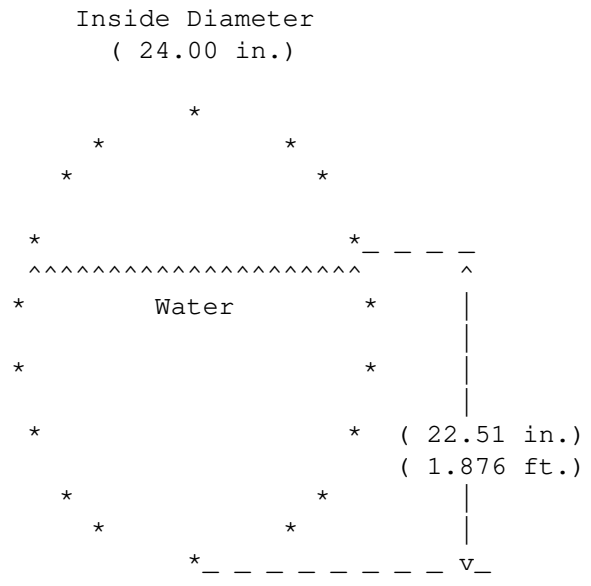


Circular Channel Section

Flowrate	7.990	CFS
Velocity	4.641	fps
Pipe Diameter	18.000	inches
Depth of Flow	16.884	inches
Depth of Flow	1.407	feet
Critical Depth	1.097	feet
Depth/Diameter (D/d)	0.938	
Slope of Pipe	0.500	%
X-Sectional Area	1.722	sq. ft.
Wetted Perimeter	3.957	feet
AR^(2/3)	0.989	
Mannings 'n'	0.013	
Min. Fric. Slope, 18 inch Pipe Flowing Full	0.579	%

EXHIBIT J3

Joseph E. Bonadiman & Assoc., Inc.
Consulting Engineers
234 N. Arrowhead Ave.
San Bernardino, California 92408
(909)885-3806

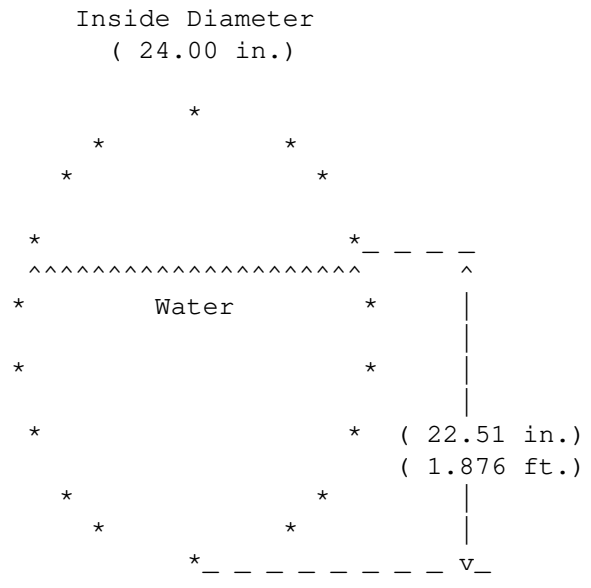


Circular Channel Section

Flowrate	17.207	CFS
Velocity	5.622	fps
Pipe Diameter	24.000	inches
Depth of Flow	22.512	inches
Depth of Flow	1.876	feet
Critical Depth	1.491	feet
Depth/Diameter (D/d)	0.938	
Slope of Pipe	0.500	%
X-Sectional Area	3.061	sq. ft.
Wetted Perimeter	5.277	feet
AR^(2/3)	2.129	
Mannings 'n'	0.013	
Min. Fric. Slope, 24 inch Pipe Flowing Full	0.579	%

EXHIBIT J4

Joseph E. Bonadiman & Assoc., Inc.
Consulting Engineers
234 N. Arrowhead Ave.
San Bernardino, California 92408
(909)885-3806



Circular Channel Section

Flowrate	21.766	CFS
Velocity	7.111	fps
Pipe Diameter	24.000	inches
Depth of Flow	22.512	inches
Depth of Flow	1.876	feet
Critical Depth	1.671	feet
Depth/Diameter (D/d)	0.938	
Slope of Pipe	0.800	%
X-Sectional Area	3.061	sq. ft.
Wetted Perimeter	5.277	feet
AR^(2/3)	2.129	
Mannings 'n'	0.013	
Min. Fric. Slope, 24 inch Pipe Flowing Full	0.926	%

EXHIBIT J5

The factor k_h has a constant value equal to 0.003 ft. The factor k_b varies with the ratio of crest length to average width of approach channel (L/B). Values of k_b for ratios of L/B from 0 to 1 are available from Figure 3 (as given in *Water Measurement Manual*).

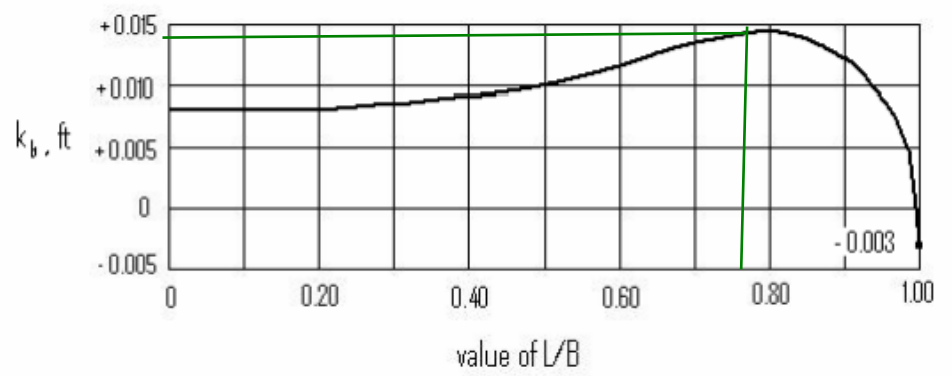


Figure 3. k_b as a function of L/B (as given in *Water Measurement Manual*)

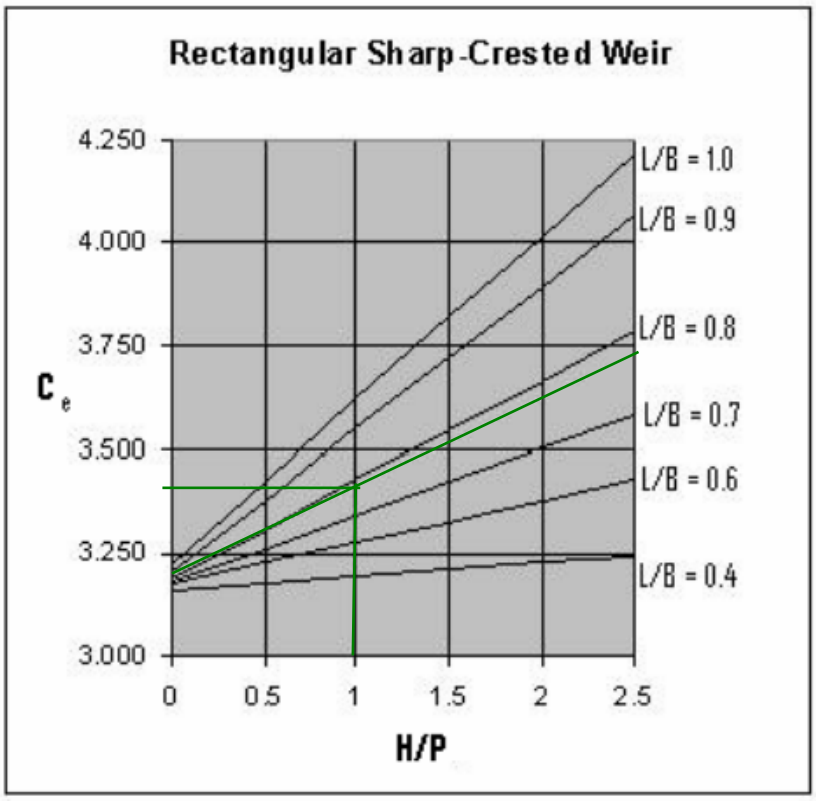


Figure 4. C_e as a function of H/P & L/B for Rect. Sharp-crested Weir

EXHIBIT K

APPENDIX B

Calculations

100-Year 24-Hour 1,956 Acre Off-Site Unit Hydrograph

100-Year 24-Hour 85.83 Acre On and Off Site Pre Developed Unit Hydrograph

100-Year 24-Hour 85.83 Acre On and Off Site Post Developed Unit Hydrograph

Clarifier Manufacturers Specifications

WQMP – Short Form

U n i t H y d r o g r a p h A n a l y s i s

Study date 07/10/23

++

San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6434

PRE-DEVELOPED WATERSHED
100-YEAR 24-HOUR
AMC III

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
0.00	1	1.12
1956.00	1	1.12
Rainfall data for year 100		
1956.00	6	2.06
Rainfall data for year 100		
1956.00	24	3.47

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
83.0	95.8	1017.00	0.520	0.083	0.900	0.074
77.0	92.2	548.00	0.280	0.151	0.900	0.136
46.0	66.0	391.00	0.200	0.593	0.900	0.534

Area-averaged adjusted loss rate Fm (In/Hr) = 0.184

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
915.30	0.468	83.0	95.8	0.44	0.863
101.70	0.052	98.0	98.0	0.20	0.933
493.20	0.252	77.0	92.2	0.85	0.757
54.80	0.028	98.0	98.0	0.20	0.933
351.90	0.180	46.0	66.0	5.15	0.226
39.10	0.020	98.0	98.0	0.20	0.933

Area-averaged catchment yield fraction, Y = 0.729
Area-averaged low loss fraction, Yb = 0.271
++
Watercourse length = 31535.00(Ft.)
Length from concentration point to centroid = 17553.00(Ft.)
Elevation difference along watercourse = 1133.00(Ft.)
Mannings friction factor along watercourse = 0.033
Watershed area = 1956.00(Ac.)
Catchment Lag time = 0.910 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 9.1566
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.184(In/Hr)
Average low loss rate fraction (Yb) = 0.271 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.531(In)
Computed peak 30-minute rainfall = 0.910(In)
Specified peak 1-hour rainfall = 1.120(In)
Computed peak 3-hour rainfall = 1.627(In)
Specified peak 6-hour rainfall = 2.060(In)
Specified peak 24-hour rainfall = 3.470(In)

Rainfall depth area reduction factors:
Using a total area of 1956.00(Ac.) (Ref: fig. E-4)

5-minute factor = 0.908 Adjusted rainfall = 0.483(In)
30-minute factor = 0.908 Adjusted rainfall = 0.826(In)
1-hour factor = 0.908 Adjusted rainfall = 1.017(In)
3-hour factor = 0.988 Adjusted rainfall = 1.608(In)
6-hour factor = 0.994 Adjusted rainfall = 2.047(In)
24-hour factor = 0.998 Adjusted rainfall = 3.462(In)

U n i t H y d r o g r a p h
++

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 23655.38 (CFS))		
1	0.403	95.305
2	1.356	225.531
3	2.872	358.645
4	4.948	490.969
5	7.548	615.162
6	11.026	822.729
7	16.645	1329.063
8	24.823	1934.488

9	33.695	2098.877
10	41.366	1814.618
11	47.529	1457.752
12	52.756	1236.594
13	57.201	1051.294
14	60.728	834.343
15	63.724	708.884
16	66.369	625.517
17	68.744	561.906
18	70.946	520.854
19	72.879	457.364
20	74.624	412.705
21	76.227	379.177
22	77.770	364.893
23	79.095	313.569
24	80.304	285.916
25	81.492	281.164
26	82.517	242.449
27	83.506	233.931
28	84.468	227.612
29	85.352	209.130
30	86.231	207.939
31	87.042	191.735
32	87.775	173.301
33	88.502	172.068
34	89.105	142.580
35	89.654	129.962
36	90.199	128.850
37	90.716	122.353
38	91.229	121.298
39	91.720	116.078
40	92.161	104.403
41	92.600	103.960
42	93.020	99.249
43	93.423	95.305
44	93.821	94.226
45	94.154	78.717
46	94.465	73.645
47	94.777	73.645
48	95.088	73.645
49	95.399	73.645
50	95.684	67.310
51	95.923	56.499
52	96.161	56.317
53	96.399	56.317
54	96.637	56.317
55	96.869	54.968
56	97.047	42.164
57	97.212	38.988
58	97.377	38.988
59	97.542	38.988
60	97.707	38.988
61	97.840	31.430
62	97.931	21.698
63	98.023	21.660
64	98.114	21.660
65	98.206	21.660
66	98.300	22.146
67	98.407	25.392
68	98.517	25.992
69	98.627	25.992
70	98.737	25.992
71	98.846	25.992

72	98.956	25.992
73	99.066	25.992
74	99.176	25.992
75	99.286	25.992
76	99.396	25.992
77	99.498	24.092
78	99.560	14.785
79	99.617	13.538
80	99.675	13.538
81	99.732	13.538
82	99.789	13.538
83	99.846	13.538
84	99.904	13.538
85	99.961	13.538
86	100.000	9.266

Total soil rain loss = 0.80(In)
Total effective rainfall = 2.66(In)
Peak flow rate in flood hydrograph = 1680.56(CFS)

++

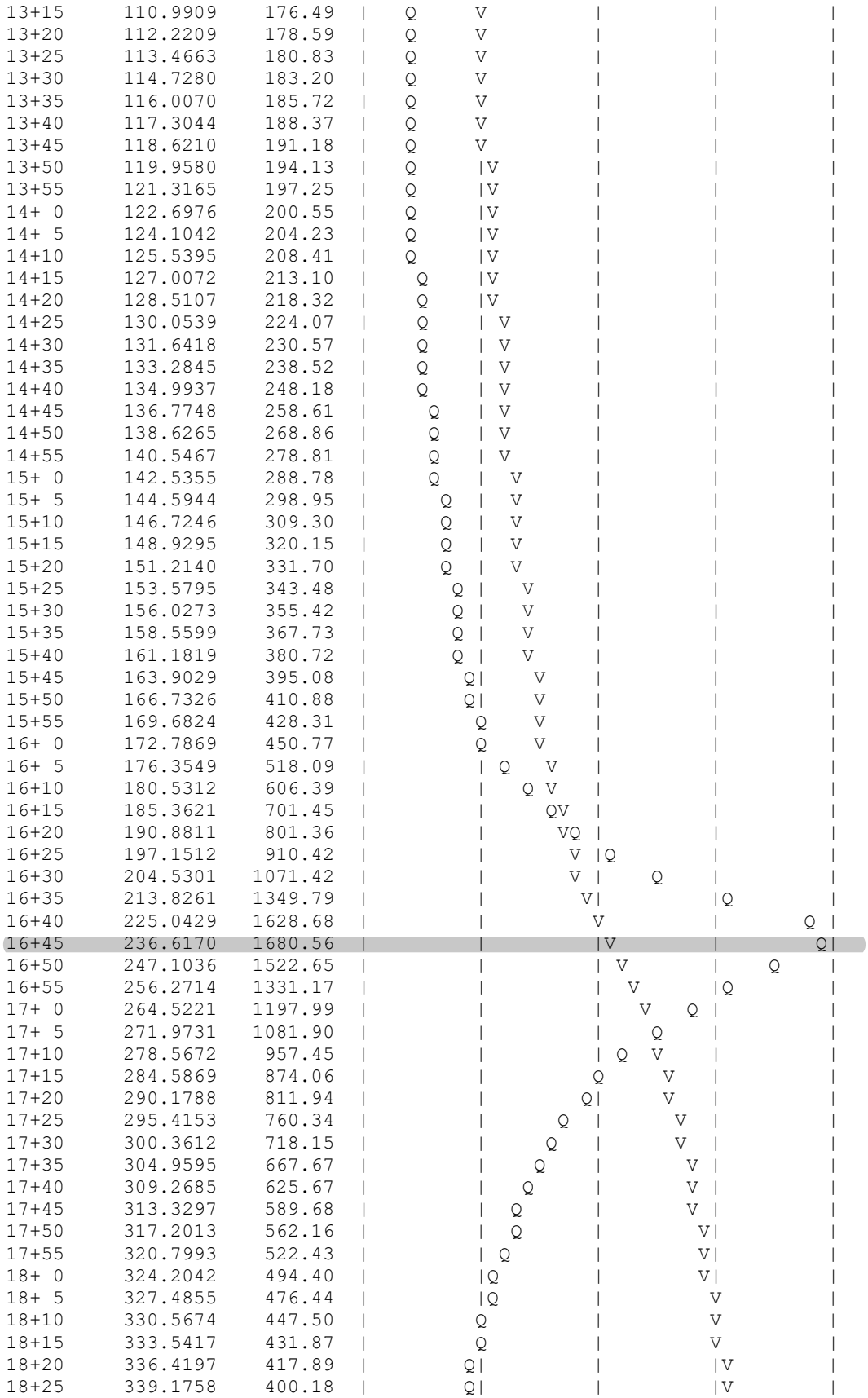
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	425.0	850.0	1275.0	1700.0
0+ 5	0.0022	0.32	Q				
0+10	0.0095	1.07	Q				
0+15	0.0251	2.26	Q				
0+20	0.0519	3.90	Q				
0+25	0.0929	5.95	Q				
0+30	0.1529	8.70	Q				
0+35	0.2434	13.14	Q				
0+40	0.3784	19.61	Q				
0+45	0.5619	26.64	Q				
0+50	0.7874	32.75	Q				
0+55	1.0470	37.69	Q				
1+ 0	1.3357	41.92	Q				
1+ 5	1.6495	45.55	VQ				
1+10	1.9833	48.47	VQ				
1+15	2.3344	50.99	VQ				
1+20	2.7011	53.23	VQ				
1+25	3.0818	55.28	VQ				
1+30	3.4757	57.19	VQ				
1+35	3.8814	58.91	VQ				
1+40	4.2979	60.48	VQ				
1+45	4.7245	61.94	VQ				
1+50	5.1609	63.37	VQ				
1+55	5.6060	64.63	VQ				
2+ 0	6.0591	65.80	VQ				
2+ 5	6.5203	66.96	VQ				
2+10	6.9886	68.00	VQ				
2+15	7.4639	69.02	VQ				
2+20	7.9462	70.02	VQ				
2+25	8.4349	70.96	VQ				
2+30	8.9301	71.90	VQ				
2+35	9.4314	72.80	VQ				
2+40	9.9385	73.64	VQ				

2+45	10.4514	74.47	VQ	|	|	|	|
2+50	10.9695	75.22	|Q	|	|	|	|
2+55	11.4924	75.92	|Q	|	|	|	|
3+ 0	12.0201	76.63	|Q	|	|	|	|
3+ 5	12.5526	77.32	|Q	|	|	|	|
3+10	13.0899	78.01	|Q	|	|	|	|
3+15	13.6318	78.69	|Q	|	|	|	|
3+20	14.1782	79.33	|Q	|	|	|	|
3+25	14.7290	79.98	|Q	|	|	|	|
3+30	15.2841	80.61	|Q	|	|	|	|
3+35	15.8436	81.23	|Q	|	|	|	|
3+40	16.4074	81.86	|Q	|	|	|	|
3+45	16.9751	82.44	|Q	|	|	|	|
3+50	17.5467	83.00	|Q	|	|	|	|
3+55	18.1223	83.57	|Q	|	|	|	|
4+ 0	18.7018	84.14	|Q	|	|	|	|
4+ 5	19.2853	84.72	|Q	|	|	|	|
4+10	19.8726	85.28	|VQ	|	|	|	|
4+15	20.4636	85.81	|VQ	|	|	|	|
4+20	21.0582	86.34	|VQ	|	|	|	|
4+25	21.6566	86.88	|VQ	|	|	|	|
4+30	22.2586	87.42	| Q	|	|	|	|
4+35	22.8644	87.96	| Q	|	|	|	|
4+40	23.4737	88.46	| Q	|	|	|	|
4+45	24.0864	88.96	| Q	|	|	|	|
4+50	24.7025	89.46	| Q	|	|	|	|
4+55	25.3222	89.97	| Q	|	|	|	|
5+ 0	25.9453	90.48	| Q	|	|	|	|
5+ 5	26.5718	90.97	| Q	|	|	|	|
5+10	27.2015	91.43	| Q	|	|	|	|
5+15	27.8344	91.90	| Q	|	|	|	|
5+20	28.4706	92.37	| Q	|	|	|	|
5+25	29.1100	92.85	| Q	|	|	|	|
5+30	29.7528	93.33	| Q	|	|	|	|
5+35	30.3990	93.83	| Q	|	|	|	|
5+40	31.0487	94.34	| Q	|	|	|	|
5+45	31.7020	94.85	| Q	|	|	|	|
5+50	32.3587	95.36	| Q	|	|	|	|
5+55	33.0191	95.89	| QV	|	|	|	|
6+ 0	33.6831	96.41	| QV	|	|	|	|
6+ 5	34.3508	96.95	| QV	|	|	|	|
6+10	35.0222	97.49	| QV	|	|	|	|
6+15	35.6974	98.03	| QV	|	|	|	|
6+20	36.3763	98.58	| QV	|	|	|	|
6+25	37.0591	99.13	| QV	|	|	|	|
6+30	37.7454	99.66	| QV	|	|	|	|
6+35	38.4354	100.19	| QV	|	|	|	|
6+40	39.1291	100.72	| QV	|	|	|	|
6+45	39.8265	101.26	| QV	|	|	|	|
6+50	40.5277	101.81	| QV	|	|	|	|
6+55	41.2327	102.37	| QV	|	|	|	|
7+ 0	41.9416	102.93	| QV	|	|	|	|
7+ 5	42.6543	103.50	| QV	|	|	|	|
7+10	43.3710	104.06	| Q V	|	|	|	|
7+15	44.0913	104.60	| Q V	|	|	|	|
7+20	44.8154	105.14	| Q V	|	|	|	|
7+25	45.5434	105.69	| Q V	|	|	|	|
7+30	46.2751	106.25	| Q V	|	|	|	|
7+35	47.0108	106.82	| Q V	|	|	|	|
7+40	47.7505	107.40	| Q V	|	|	|	|
7+45	48.4942	107.98	| Q V	|	|	|	|
7+50	49.2420	108.58	| Q V	|	|	|	|
7+55	49.9939	109.18	| Q V	|	|	|	|

8+ 0	50.7500	109.79	Q V			
8+ 5	51.5104	110.41	Q V			
8+10	52.2752	111.04	Q V			
8+15	53.0443	111.68	Q V			
8+20	53.8179	112.33	Q V			
8+25	54.5961	112.99	Q V			
8+30	55.3788	113.66	Q V			
8+35	56.1663	114.33	Q V			
8+40	56.9584	115.03	Q V			
8+45	57.7555	115.73	Q V			
8+50	58.5574	116.44	Q V			
8+55	59.3643	117.16	Q V			
9+ 0	60.1763	117.90	Q V			
9+ 5	60.9934	118.65	Q V			
9+10	61.8158	119.41	Q V			
9+15	62.6435	120.19	Q V			
9+20	63.4767	120.97	Q V			
9+25	64.3154	121.78	Q V			
9+30	65.1597	122.59	Q V			
9+35	66.0097	123.42	Q V			
9+40	66.8655	124.27	Q V			
9+45	67.7273	125.13	Q V			
9+50	68.5951	126.01	Q V			
9+55	69.4691	126.90	Q V			
10+ 0	70.3493	127.81	Q V			
10+ 5	71.2359	128.74	Q V			
10+10	72.1291	129.68	Q V			
10+15	73.0288	130.65	Q V			
10+20	73.9354	131.63	Q V			
10+25	74.8489	132.64	Q V			
10+30	75.7694	133.66	Q V			
10+35	76.6972	134.71	Q V			
10+40	77.6322	135.77	Q V			
10+45	78.5748	136.87	Q V			
10+50	79.5251	137.98	Q V			
10+55	80.4832	139.12	Q V			
11+ 0	81.4493	140.28	Q V			
11+ 5	82.4237	141.47	Q V			
11+10	83.4064	142.69	Q V			
11+15	84.3976	143.93	Q V			
11+20	85.3977	145.21	Q V			
11+25	86.4067	146.51	Q V			
11+30	87.4249	147.85	Q V			
11+35	88.4526	149.22	Q V			
11+40	89.4900	150.62	Q V			
11+45	90.5372	152.06	Q V			
11+50	91.5946	153.54	Q V			
11+55	92.6625	155.05	Q V			
12+ 0	93.7411	156.61	Q V			
12+ 5	94.8303	158.15	Q V			
12+10	95.9298	159.65	Q V			
12+15	97.0393	161.11	Q V			
12+20	98.1587	162.53	Q V			
12+25	99.2876	163.92	Q V			
12+30	100.4256	165.24	Q V			
12+35	101.5708	166.28	Q V			
12+40	102.7208	166.99	Q V			
12+45	103.8755	167.65	Q V			
12+50	105.0363	168.55	Q V			
12+55	106.2053	169.74	Q V			
13+ 0	107.3839	171.14	Q V			
13+ 5	108.5735	172.72	Q V			
13+10	109.7754	174.52	Q V			



18+30	341.8566	389.24	| Q|	|	|	|V |
18+35	344.4261	373.10	| Q |	|	|	|V |
18+40	346.8853	357.08	| Q |	|	|	| V |
18+45	349.2795	347.64	| Q |	|	|	| V |
18+50	351.5371	327.80	| Q |	|	|	| V |
18+55	353.7112	315.68	| Q |	|	|	| V |
19+ 0	355.8373	308.71	| Q |	|	|	| V |
19+ 5	357.9045	300.15	| Q |	|	|	| V |
19+10	359.9265	293.59	| Q |	|	|	| V |
19+15	361.8913	285.30	| Q |	|	|	| V |
19+20	363.7847	274.92	| Q |	|	|	| V |
19+25	365.6388	269.20	| Q |	|	|	| V |
19+30	367.4437	262.07	| Q |	|	|	| V |
19+35	369.2020	255.31	| Q |	|	|	| V |
19+40	370.9190	249.32	| Q |	|	|	| V |
19+45	372.5584	238.04	| Q |	|	|	| V |
19+50	374.1533	231.57	| Q |	|	|	| V |
19+55	375.7203	227.53	| Q |	|	|	| V |
20+ 0	377.2605	223.63	| Q |	|	|	| V |
20+ 5	378.7711	219.35	| Q |	|	|	| V |
20+10	380.2338	212.38	| Q |	|	|	| V |
20+15	381.6399	204.16	| Q |	|	|	| V |
20+20	383.0213	200.58	| Q |	|	|	| V |
20+25	384.3801	197.29	| Q |	|	|	| V |
20+30	385.7148	193.81	| Q |	|	|	| V |
20+35	387.0188	189.34	| Q |	|	|	| V |
20+40	388.2628	180.63	| Q |	|	|	| V |
20+45	389.4767	176.25	| Q |	|	|	| V |
20+50	390.6709	173.41	| Q |	|	|	| V |
20+55	391.8453	170.52	| Q |	|	|	| V |
21+ 0	392.9967	167.18	| Q |	|	|	| V |
21+ 5	394.1040	160.79	| Q |	|	|	| V |
21+10	395.1652	154.08	| Q |	|	|	| V |
21+15	396.2099	151.69	| Q |	|	|	| V |
21+20	397.2403	149.62	| Q |	|	|	| V |
21+25	398.2578	147.74	| Q |	|	|	| V |
21+30	399.2646	146.19	| Q |	|	|	| V |
21+35	400.2684	145.75	| Q |	|	|	| V |
21+40	401.2618	144.24	| Q |	|	|	| V |
21+45	402.2431	142.49	| Q |	|	|	| V |
21+50	403.2128	140.79	| Q |	|	|	| V |
21+55	404.1711	139.15	| Q |	|	|	| V |
22+ 0	405.1180	137.50	| Q |	|	|	| V |
22+ 5	406.0537	135.86	| Q |	|	|	| V |
22+10	406.9778	134.19	| Q |	|	|	| V |
22+15	407.8899	132.43	| Q |	|	|	| V |
22+20	408.7880	130.40	| Q |	|	|	| V |
22+25	409.6648	127.31	| Q |	|	|	| V |
22+30	410.5020	121.57	| Q |	|	|	| V |
22+35	411.3243	119.39	| Q |	|	|	| V |
22+40	412.1362	117.90	| Q |	|	|	| V |
22+45	412.9383	116.46	| Q |	|	|	| V |
22+50	413.7303	114.99	| Q |	|	|	| V |
22+55	414.5119	113.49	| Q |	|	|	| V |
23+ 0	415.2824	111.89	| Q |	|	|	| V |
23+ 5	416.0396	109.95	| Q |	|	|	| V |
23+10	416.7706	106.13	| Q |	|	|	| V |
23+15	417.4641	100.71	| Q |	|	|	| V |
23+20	418.1480	99.30	| Q |	|	|	| V |
23+25	418.8237	98.11	| Q |	|	|	| V |
23+30	419.4918	97.01	| Q |	|	|	| V |
23+35	420.1525	95.93	| Q |	|	|	| V |
23+40	420.8060	94.90	| Q |	|	|	| V |

23+45	421.4529	93.92	| Q	|	|	|	V |
23+50	422.0932	92.98	| Q	|	|	|	V |
23+55	422.7273	92.07	| Q	|	|	|	V|
24+ 0	423.3554	91.20	| Q	|	|	|	V|
24+ 5	423.9756	90.04	| Q	|	|	|	V|
24+10	424.5850	88.49	| Q	|	|	|	V|
24+15	425.1811	86.55	| Q	|	|	|	V|
24+20	425.7609	84.19	|Q	|	|	|	V|
24+25	426.3219	81.46	|Q	|	|	|	V|
24+30	426.8595	78.06	|Q	|	|	|	V|
24+35	427.3624	73.02	|Q	|	|	|	V|
24+40	427.8171	66.02	|Q	|	|	|	V|
24+45	428.2201	58.52	|Q	|	|	|	V|
24+50	428.5785	52.03	|Q	|	|	|	V|
24+55	428.9006	46.77	|Q	|	|	|	V|
25+ 0	429.1918	42.29	Q	|	|	|	V|
25+ 5	429.4567	38.45	Q	|	|	|	V|
25+10	429.7002	35.37	Q	|	|	|	V|
25+15	429.9256	32.72	Q	|	|	|	V|
25+20	430.1347	30.36	Q	|	|	|	V|
25+25	430.3292	28.24	Q	|	|	|	V|
25+30	430.5101	26.28	Q	|	|	|	V|
25+35	430.6791	24.54	Q	|	|	|	V|
25+40	430.8372	22.96	Q	|	|	|	V|
25+45	430.9853	21.51	Q	|	|	|	V|
25+50	431.1239	20.12	Q	|	|	|	V|
25+55	431.2541	18.91	Q	|	|	|	V|
26+ 0	431.3767	17.80	Q	|	|	|	V|
26+ 5	431.4918	16.72	Q	|	|	|	V|
26+10	431.6004	15.77	Q	|	|	|	V|
26+15	431.7028	14.87	Q	|	|	|	V|
26+20	431.7991	13.99	Q	|	|	|	V|
26+25	431.8899	13.18	Q	|	|	|	V|
26+30	431.9752	12.38	Q	|	|	|	V|
26+35	432.0553	11.64	Q	|	|	|	V|
26+40	432.1309	10.97	Q	|	|	|	V|
26+45	432.2019	10.31	Q	|	|	|	V|
26+50	432.2691	9.75	Q	|	|	|	V|
26+55	432.3327	9.24	Q	|	|	|	V|
27+ 0	432.3930	8.74	Q	|	|	|	V|
27+ 5	432.4499	8.27	Q	|	|	|	V|
27+10	432.5036	7.80	Q	|	|	|	V|
27+15	432.5542	7.35	Q	|	|	|	V|
27+20	432.6020	6.94	Q	|	|	|	V|
27+25	432.6471	6.54	Q	|	|	|	V|
27+30	432.6895	6.16	Q	|	|	|	V|
27+35	432.7295	5.80	Q	|	|	|	V|
27+40	432.7670	5.44	Q	|	|	|	V|
27+45	432.8023	5.14	Q	|	|	|	V|
27+50	432.8358	4.85	Q	|	|	|	V|
27+55	432.8673	4.57	Q	|	|	|	V|
28+ 0	432.8968	4.29	Q	|	|	|	V|
28+ 5	432.9245	4.01	Q	|	|	|	V|
28+10	432.9504	3.76	Q	|	|	|	V|
28+15	432.9748	3.54	Q	|	|	|	V|
28+20	432.9977	3.33	Q	|	|	|	V|
28+25	433.0192	3.12	Q	|	|	|	V|
28+30	433.0392	2.91	Q	|	|	|	V|
28+35	433.0579	2.70	Q	|	|	|	V|
28+40	433.0754	2.54	Q	|	|	|	V|
28+45	433.0919	2.40	Q	|	|	|	V|
28+50	433.1074	2.25	Q	|	|	|	V|
28+55	433.1218	2.10	Q	|	|	|	V|

29+ 0	433.1353	1.96	Q				V
29+ 5	433.1480	1.84	Q				V
29+10	433.1601	1.75	Q				V
29+15	433.1716	1.67	Q				V
29+20	433.1825	1.59	Q				V
29+25	433.1929	1.50	Q				V
29+30	433.2026	1.42	Q				V
29+35	433.2117	1.32	Q				V
29+40	433.2202	1.23	Q				V
29+45	433.2280	1.13	Q				V
29+50	433.2352	1.04	Q				V
29+55	433.2417	0.95	Q				V
30+ 0	433.2476	0.85	Q				V
30+ 5	433.2528	0.76	Q				V
30+10	433.2574	0.67	Q				V
30+15	433.2614	0.58	Q				V
30+20	433.2648	0.49	Q				V
30+25	433.2676	0.41	Q				V
30+30	433.2701	0.35	Q				V
30+35	433.2722	0.31	Q				V
30+40	433.2740	0.26	Q				V
30+45	433.2754	0.21	Q				V
30+50	433.2766	0.17	Q				V
30+55	433.2774	0.12	Q				V
31+ 0	433.2780	0.08	Q				V
31+ 5	433.2782	0.03	Q				V

U n i t H y d r o g r a p h A n a l y s i s

Study date 12/14/23

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San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6434

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100 year 24 hour storm
AMC III
PREDEVELOPED OFFSITE
85.83 ACRES

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
85.83	1	1.08
Rainfall data for year 100		
85.83	6	2.01
Rainfall data for year 100		
85.83	24	3.43

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******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
46.0	66.0	59.29	0.691	0.593	0.900	0.534
77.0	92.2	26.54	0.309	0.151	0.900	0.136

Area-averaged adjusted loss rate Fm (In/Hr) = 0.411

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
53.36	0.622	46.0	66.0	5.15	0.222
5.93	0.069	98.0	98.0	0.20	0.932
23.89	0.278	77.0	92.2	0.85	0.755
2.65	0.031	98.0	98.0	0.20	0.932

Area-averaged catchment yield fraction, Y = 0.441
Area-averaged low loss fraction, Yb = 0.559
++
Watercourse length = 4521.00(Ft.)
Length from concentration point to centroid = 2124.00(Ft.)
Elevation difference along watercourse = 59.00(Ft.)
Mannings friction factor along watercourse = 0.033
Watershed area = 85.83(Ac.)
Catchment Lag time = 0.236 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 35.2578
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.411(In/Hr)
Average low loss rate fraction (Yb) = 0.559 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.512(In)
Computed peak 30-minute rainfall = 0.877(In)
Specified peak 1-hour rainfall = 1.080(In)
Computed peak 3-hour rainfall = 1.581(In)
Specified peak 6-hour rainfall = 2.010(In)
Specified peak 24-hour rainfall = 3.430(In)

Rainfall depth area reduction factors:
Using a total area of 85.83(Ac.) (Ref: fig. E-4)

5-minute factor = 0.996 Adjusted rainfall = 0.510(In)
30-minute factor = 0.996 Adjusted rainfall = 0.874(In)
1-hour factor = 0.996 Adjusted rainfall = 1.076(In)
3-hour factor = 0.999 Adjusted rainfall = 1.580(In)
6-hour factor = 1.000 Adjusted rainfall = 2.009(In)
24-hour factor = 1.000 Adjusted rainfall = 3.430(In)

U n i t H y d r o g r a p h

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Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 1038.01 (CFS))	
1	2.258	23.441
2	13.641	118.149
3	41.424	288.396
4	60.328	196.226
5	70.443	104.987
6	77.196	70.099
7	81.989	49.757
8	85.673	38.232
9	88.590	30.285
10	90.753	22.450
11	92.561	18.762
12	94.065	15.614
13	95.277	12.579
14	96.275	10.368

15	97.098	8.534
16	97.714	6.401
17	98.118	4.186
18	98.504	4.013
19	98.927	4.392
20	99.348	4.369
21	99.642	3.054
22	99.863	2.287
23	100.000	1.424

Total soil rain loss = 1.62(In)
Total effective rainfall = 1.81(In)
Peak flow rate in flood hydrograph = 167.76(CFS)

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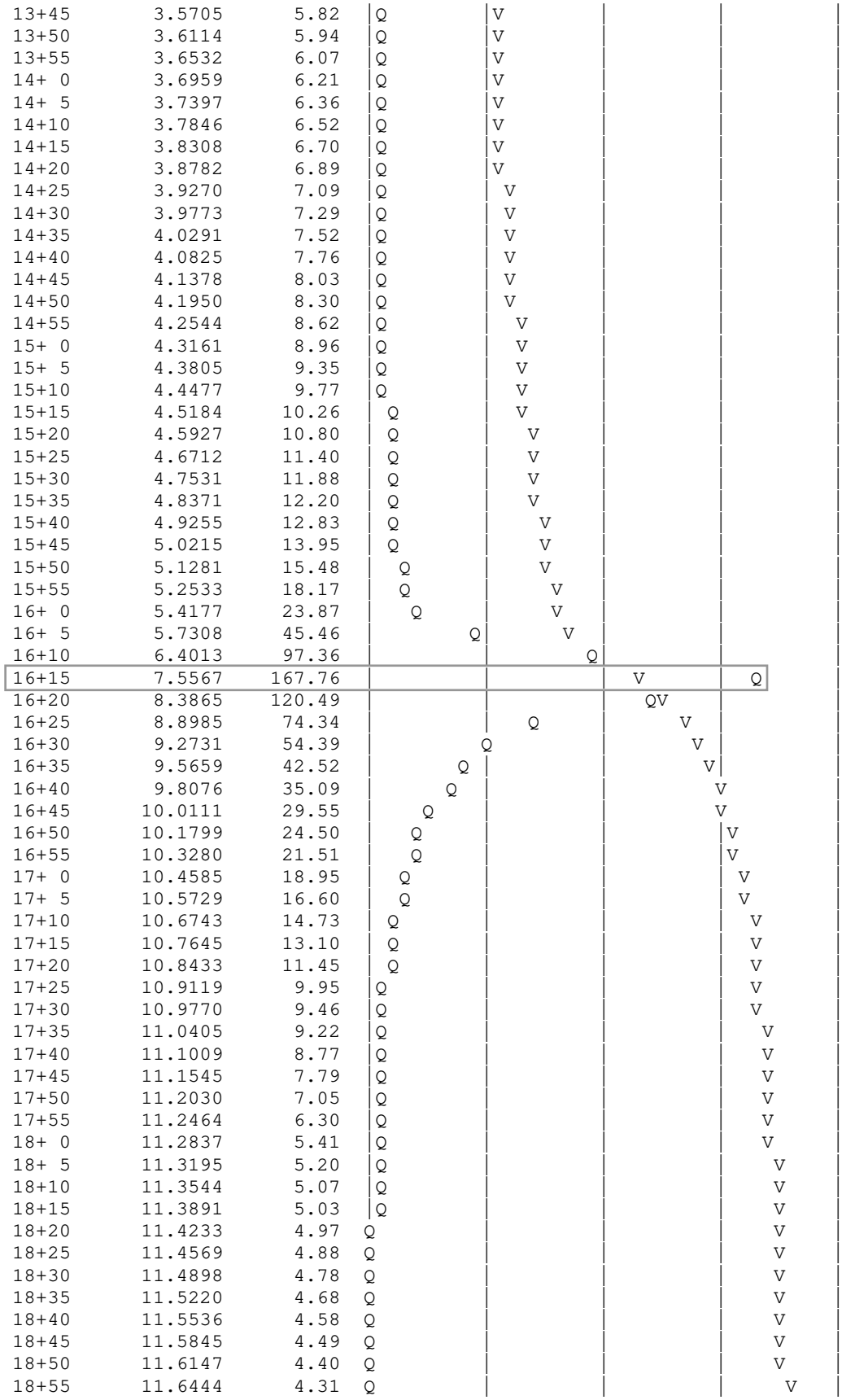
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	50.0	100.0	150.0	200.0
0+ 5	0.0003	0.05	Q				
0+10	0.0023	0.29	Q				
0+15	0.0083	0.87	Q				
0+20	0.0171	1.27	Q				
0+25	0.0274	1.49	Q				
0+30	0.0387	1.64	Q				
0+35	0.0507	1.74	Q				
0+40	0.0633	1.83	Q				
0+45	0.0763	1.90	Q				
0+50	0.0897	1.95	Q				
0+55	0.1034	1.99	Q				
1+ 0	0.1174	2.03	Q				
1+ 5	0.1316	2.06	Q				
1+10	0.1460	2.09	Q				
1+15	0.1606	2.11	Q				
1+20	0.1753	2.13	Q				
1+25	0.1901	2.15	Q				
1+30	0.2050	2.17	Q				
1+35	0.2200	2.18	Q				
1+40	0.2352	2.20	Q				
1+45	0.2504	2.21	Q				
1+50	0.2657	2.23	Q				
1+55	0.2811	2.24	Q				
2+ 0	0.2966	2.24	Q				
2+ 5	0.3121	2.25	Q				
2+10	0.3277	2.26	QV				
2+15	0.3433	2.27	QV				
2+20	0.3590	2.28	QV				
2+25	0.3747	2.28	QV				
2+30	0.3905	2.29	QV				
2+35	0.4063	2.30	QV				
2+40	0.4222	2.31	QV				
2+45	0.4382	2.32	QV				
2+50	0.4542	2.33	QV				
2+55	0.4703	2.34	QV				
3+ 0	0.4865	2.35	QV				
3+ 5	0.5027	2.35	QV				
3+10	0.5190	2.36	QV				

3+15	0.5353	2.37	QV				
3+20	0.5517	2.38	QV				
3+25	0.5682	2.39	QV				
3+30	0.5847	2.40	QV				
3+35	0.6013	2.41	QV				
3+40	0.6180	2.42	QV				
3+45	0.6347	2.43	QV				
3+50	0.6515	2.44	Q V				
3+55	0.6684	2.45	Q V				
4+ 0	0.6853	2.46	Q V				
4+ 5	0.7023	2.47	Q V				
4+10	0.7194	2.48	Q V				
4+15	0.7366	2.49	Q V				
4+20	0.7538	2.50	Q V				
4+25	0.7711	2.51	Q V				
4+30	0.7885	2.52	Q V				
4+35	0.8059	2.53	Q V				
4+40	0.8234	2.54	Q V				
4+45	0.8410	2.56	Q V				
4+50	0.8587	2.57	Q V				
4+55	0.8765	2.58	Q V				
5+ 0	0.8943	2.59	Q V				
5+ 5	0.9122	2.60	Q V				
5+10	0.9302	2.61	Q V				
5+15	0.9483	2.63	Q V				
5+20	0.9665	2.64	Q V				
5+25	0.9847	2.65	Q V				
5+30	1.0030	2.66	Q V				
5+35	1.0215	2.67	Q V				
5+40	1.0400	2.69	Q V				
5+45	1.0586	2.70	Q V				
5+50	1.0773	2.71	Q V				
5+55	1.0960	2.73	Q V				
6+ 0	1.1149	2.74	Q V				
6+ 5	1.1339	2.75	Q V				
6+10	1.1529	2.77	Q V				
6+15	1.1721	2.78	Q V				
6+20	1.1913	2.80	Q V				
6+25	1.2107	2.81	Q V				
6+30	1.2301	2.82	Q V				
6+35	1.2497	2.84	Q V				
6+40	1.2693	2.85	Q V				
6+45	1.2891	2.87	Q V				
6+50	1.3090	2.88	Q V				
6+55	1.3289	2.90	Q V				
7+ 0	1.3490	2.92	Q V				
7+ 5	1.3692	2.93	Q V				
7+10	1.3895	2.95	Q V				
7+15	1.4099	2.96	Q V				
7+20	1.4305	2.98	Q V				
7+25	1.4511	3.00	Q V				
7+30	1.4719	3.01	Q V				
7+35	1.4927	3.03	Q V				
7+40	1.5138	3.05	Q V				
7+45	1.5349	3.07	Q V				
7+50	1.5561	3.09	Q V				
7+55	1.5775	3.11	Q V				
8+ 0	1.5990	3.12	Q V				
8+ 5	1.6207	3.14	Q V				
8+10	1.6425	3.16	Q V				
8+15	1.6644	3.18	Q V				
8+20	1.6864	3.20	Q V				
8+25	1.7086	3.22	Q V				

8+30	1.7310	3.24	Q	V	|	|	|	|
8+35	1.7535	3.27	Q	V	|	|	|	|
8+40	1.7761	3.29	Q	V	|	|	|	|
8+45	1.7989	3.31	Q	V	|	|	|	|
8+50	1.8218	3.33	Q	V	|	|	|	|
8+55	1.8449	3.35	Q	V	|	|	|	|
9+ 0	1.8682	3.38	Q	V	|	|	|	|
9+ 5	1.8916	3.40	Q	V	|	|	|	|
9+10	1.9152	3.42	Q	V	|	|	|	|
9+15	1.9390	3.45	Q	V	|	|	|	|
9+20	1.9629	3.47	Q	V	|	|	|	|
9+25	1.9870	3.50	Q	V	|	|	|	|
9+30	2.0113	3.52	Q	V	|	|	|	|
9+35	2.0357	3.55	Q	V	|	|	|	|
9+40	2.0604	3.58	Q	V	|	|	|	|
9+45	2.0852	3.61	Q	V	|	|	|	|
9+50	2.1102	3.63	Q	V	|	|	|	|
9+55	2.1355	3.66	Q	V	|	|	|	|
10+ 0	2.1609	3.69	Q	V	|	|	|	|
10+ 5	2.1865	3.72	Q	V	|	|	|	|
10+10	2.2124	3.75	Q	V	|	|	|	|
10+15	2.2384	3.78	Q	V	|	|	|	|
10+20	2.2647	3.82	Q	V	|	|	|	|
10+25	2.2912	3.85	Q	V	|	|	|	|
10+30	2.3179	3.88	Q	V	|	|	|	|
10+35	2.3449	3.92	Q	V	|	|	|	|
10+40	2.3721	3.95	Q	V	|	|	|	|
10+45	2.3995	3.99	Q	V	|	|	|	|
10+50	2.4272	4.02	Q	V	|	|	|	|
10+55	2.4552	4.06	Q	V	|	|	|	|
11+ 0	2.4834	4.10	Q	V	|	|	|	|
11+ 5	2.5119	4.14	Q	V	|	|	|	|
11+10	2.5407	4.18	Q	V	|	|	|	|
11+15	2.5698	4.22	Q	V	|	|	|	|
11+20	2.5991	4.26	Q	V	|	|	|	|
11+25	2.6288	4.31	Q	V	|	|	|	|
11+30	2.6587	4.35	Q	V	|	|	|	|
11+35	2.6890	4.40	Q	V	|	|	|	|
11+40	2.7196	4.44	Q	V	|	|	|	|
11+45	2.7506	4.49	Q	V	|	|	|	|
11+50	2.7819	4.54	Q	V	|	|	|	|
11+55	2.8135	4.60	Q	V	|	|	|	|
12+ 0	2.8455	4.65	Q	V	|	|	|	|
12+ 5	2.8779	4.69	Q	V	|	|	|	|
12+10	2.9102	4.69	Q	V	|	|	|	|
12+15	2.9420	4.61	Q	V	|	|	|	|
12+20	2.9735	4.58	Q	V	|	|	|	|
12+25	3.0051	4.59	Q	V	|	|	|	|
12+30	3.0370	4.62	Q	V	|	|	|	|
12+35	3.0691	4.66	Q	V	|	|	|	|
12+40	3.1015	4.71	Q	V	|	|	|	|
12+45	3.1343	4.77	Q	V	|	|	|	|
12+50	3.1676	4.83	Q	V	|	|	|	|
12+55	3.2013	4.89	Q	V	|	|	|	|
13+ 0	3.2355	4.96	Q	V	|	|	|	|
13+ 5	3.2702	5.04	|	Q	V	|	|	|
13+10	3.3054	5.12	|	Q	V	|	|	|
13+15	3.3413	5.20	|	Q	V	|	|	|
13+20	3.3777	5.29	|	Q	V	|	|	|
13+25	3.4148	5.39	|	Q	V	|	|	|
13+30	3.4526	5.49	|	Q	V	|	|	|
13+35	3.4911	5.59	|	Q	V	|	|	|
13+40	3.5304	5.70	|	Q	V	|	|	|



19+ 0	11.6735	4.23	Q	|	|	|	V |
19+ 5	11.7021	4.15	Q	|	|	|	V |
19+10	11.7301	4.07	Q	|	|	|	V |
19+15	11.7577	4.00	Q	|	|	|	V |
19+20	11.7847	3.93	Q	|	|	|	V |
19+25	11.8114	3.86	Q	|	|	|	V |
19+30	11.8375	3.80	Q	|	|	|	V |
19+35	11.8633	3.74	Q	|	|	|	V |
19+40	11.8886	3.68	Q	|	|	|	V |
19+45	11.9135	3.62	Q	|	|	|	V |
19+50	11.9381	3.57	Q	|	|	|	V |
19+55	11.9623	3.52	Q	|	|	|	V |
20+ 0	11.9862	3.46	Q	|	|	|	V |
20+ 5	12.0097	3.41	Q	|	|	|	V |
20+10	12.0329	3.37	Q	|	|	|	V |
20+15	12.0558	3.32	Q	|	|	|	V |
20+20	12.0783	3.28	Q	|	|	|	V |
20+25	12.1006	3.23	Q	|	|	|	V |
20+30	12.1226	3.19	Q	|	|	|	V |
20+35	12.1443	3.15	Q	|	|	|	V |
20+40	12.1658	3.11	Q	|	|	|	V |
20+45	12.1870	3.08	Q	|	|	|	V |
20+50	12.2079	3.04	Q	|	|	|	V |
20+55	12.2286	3.01	Q	|	|	|	V |
21+ 0	12.2491	2.97	Q	|	|	|	V |
21+ 5	12.2693	2.94	Q	|	|	|	V |
21+10	12.2893	2.91	Q	|	|	|	V |
21+15	12.3092	2.88	Q	|	|	|	V |
21+20	12.3287	2.85	Q	|	|	|	V |
21+25	12.3481	2.82	Q	|	|	|	V |
21+30	12.3673	2.79	Q	|	|	|	V |
21+35	12.3863	2.76	Q	|	|	|	V |
21+40	12.4052	2.73	Q	|	|	|	V |
21+45	12.4238	2.71	Q	|	|	|	V |
21+50	12.4423	2.68	Q	|	|	|	V |
21+55	12.4605	2.65	Q	|	|	|	V |
22+ 0	12.4786	2.63	Q	|	|	|	V |
22+ 5	12.4966	2.61	Q	|	|	|	V |
22+10	12.5144	2.58	Q	|	|	|	V |
22+15	12.5320	2.56	Q	|	|	|	V |
22+20	12.5495	2.54	Q	|	|	|	V |
22+25	12.5668	2.52	Q	|	|	|	V |
22+30	12.5840	2.49	Q	|	|	|	V |
22+35	12.6010	2.47	Q	|	|	|	V |
22+40	12.6179	2.45	Q	|	|	|	V|
22+45	12.6347	2.43	Q	|	|	|	V|
22+50	12.6513	2.41	Q	|	|	|	V|
22+55	12.6678	2.39	Q	|	|	|	V|
23+ 0	12.6842	2.38	Q	|	|	|	V|
23+ 5	12.7004	2.36	Q	|	|	|	V|
23+10	12.7165	2.34	Q	|	|	|	V|
23+15	12.7325	2.32	Q	|	|	|	V|
23+20	12.7484	2.30	Q	|	|	|	V|
23+25	12.7641	2.29	Q	|	|	|	V|
23+30	12.7798	2.27	Q	|	|	|	V|
23+35	12.7953	2.25	Q	|	|	|	V|
23+40	12.8107	2.24	Q	|	|	|	V|
23+45	12.8260	2.22	Q	|	|	|	V|
23+50	12.8412	2.21	Q	|	|	|	V|
23+55	12.8563	2.19	Q	|	|	|	V|
24+ 0	12.8713	2.18	Q	|	|	|	V|
24+ 5	12.8859	2.12	Q	|	|	|	V|
24+10	12.8987	1.86	Q	|	|	|	V|

24+15	12.9074	1.27	Q	|	|	|	V|
24+20	12.9133	0.86	Q	|	|	|	V|
24+25	12.9177	0.64	Q	|	|	|	V|
24+30	12.9211	0.50	Q	|	|	|	V|
24+35	12.9238	0.39	Q	|	|	|	V|
24+40	12.9260	0.31	Q	|	|	|	V|
24+45	12.9277	0.25	Q	|	|	|	V|
24+50	12.9291	0.20	Q	|	|	|	V|
24+55	12.9302	0.16	Q	|	|	|	V|
25+ 0	12.9311	0.13	Q	|	|	|	V|
25+ 5	12.9318	0.10	Q	|	|	|	V|
25+10	12.9323	0.08	Q	|	|	|	V|
25+15	12.9327	0.06	Q	|	|	|	V|
25+20	12.9331	0.05	Q	|	|	|	V|
25+25	12.9334	0.04	Q	|	|	|	V|
25+30	12.9336	0.03	Q	|	|	|	V|
25+35	12.9337	0.02	Q	|	|	|	V|
25+40	12.9338	0.01	Q	|	|	|	V|
25+45	12.9339	0.01	Q	|	|	|	V|
25+50	12.9339	0.00	Q	|	|	|	V

U n i t H y d r o g r a p h A n a l y s i s

Study date 12/14/23

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San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6434

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100 YEAR 24 HOUR STORM
AMC III
DEVELOPED ON AND OFF SITE
85.83 ACRES

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
85.83	1	1.08
Rainfall data for year 100		
85.83	6	2.01
Rainfall data for year 100		
85.83	24	3.43

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
46.0	66.0	59.26	0.690	0.593	0.767	0.455
77.0	92.2	26.57	0.310	0.151	0.767	0.116

Area-averaged adjusted loss rate Fm (In/Hr) = 0.350

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
45.45	0.530	46.0	66.0	5.15	0.222
13.81	0.161	98.0	98.0	0.20	0.932
20.38	0.237	77.0	92.2	0.85	0.755
6.19	0.072	98.0	98.0	0.20	0.932

Area-averaged catchment yield fraction, Y = 0.514
Area-averaged low loss fraction, Yb = 0.486
++
Watercourse length = 4521.00(Ft.)
Length from concentration point to centroid = 2124.00(Ft.)
Elevation difference along watercourse = 59.00(Ft.)
Mannings friction factor along watercourse = 0.033
Watershed area = 85.83(Ac.)
Catchment Lag time = 0.236 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 35.2578
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.350(In/Hr)
Average low loss rate fraction (Yb) = 0.486 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.512(In)
Computed peak 30-minute rainfall = 0.877(In)
Specified peak 1-hour rainfall = 1.080(In)
Computed peak 3-hour rainfall = 1.581(In)
Specified peak 6-hour rainfall = 2.010(In)
Specified peak 24-hour rainfall = 3.430(In)

Rainfall depth area reduction factors:
Using a total area of 85.83(Ac.) (Ref: fig. E-4)

5-minute factor = 0.996 Adjusted rainfall = 0.510(In)
30-minute factor = 0.996 Adjusted rainfall = 0.874(In)
1-hour factor = 0.996 Adjusted rainfall = 1.076(In)
3-hour factor = 0.999 Adjusted rainfall = 1.580(In)
6-hour factor = 1.000 Adjusted rainfall = 2.009(In)
24-hour factor = 1.000 Adjusted rainfall = 3.430(In)

U n i t H y d r o g r a p h
++

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 1038.01 (CFS))	
1	2.258	23.441
2	13.641	118.149
3	41.424	288.396
4	60.328	196.226
5	70.443	104.987
6	77.196	70.099
7	81.989	49.757
8	85.673	38.232
9	88.590	30.285
10	90.753	22.450
11	92.561	18.762
12	94.065	15.614
13	95.277	12.579
14	96.275	10.368

15	97.098	8.534
16	97.714	6.401
17	98.118	4.186
18	98.504	4.013
19	98.927	4.392
20	99.348	4.369
21	99.642	3.054
22	99.863	2.287
23	100.000	1.424

Total soil rain loss = 1.41(In)
Total effective rainfall = 2.02(In)
Peak flow rate in flood hydrograph = 172.26(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	50.0	100.0	150.0	200.0
0+ 5	0.0004	0.06	Q				
0+10	0.0027	0.33	Q				
0+15	0.0097	1.02	Q				
0+20	0.0199	1.48	Q				
0+25	0.0319	1.74	Q				
0+30	0.0450	1.91	Q				
0+35	0.0590	2.03	Q				
0+40	0.0737	2.13	Q				
0+45	0.0889	2.21	Q				
0+50	0.1045	2.27	Q				
0+55	0.1204	2.32	Q				
1+ 0	0.1367	2.36	Q				
1+ 5	0.1533	2.40	Q				
1+10	0.1700	2.43	Q				
1+15	0.1870	2.46	Q				
1+20	0.2041	2.49	Q				
1+25	0.2214	2.50	Q				
1+30	0.2387	2.52	Q				
1+35	0.2562	2.54	Q				
1+40	0.2739	2.56	Q				
1+45	0.2916	2.58	Q				
1+50	0.3095	2.59	Q				
1+55	0.3274	2.60	Q				
2+ 0	0.3454	2.61	Q				
2+ 5	0.3634	2.62	QV				
2+10	0.3816	2.63	QV				
2+15	0.3998	2.64	QV				
2+20	0.4180	2.65	QV				
2+25	0.4363	2.66	QV				
2+30	0.4547	2.67	QV				
2+35	0.4732	2.68	QV				
2+40	0.4917	2.69	QV				
2+45	0.5103	2.70	QV				
2+50	0.5290	2.71	QV				
2+55	0.5477	2.72	QV				
3+ 0	0.5665	2.73	QV				
3+ 5	0.5854	2.74	QV				
3+10	0.6043	2.75	QV				

3+15	0.6234	2.76	QV				
3+20	0.6425	2.77	QV				
3+25	0.6617	2.78	QV				
3+30	0.6809	2.80	QV				
3+35	0.7002	2.81	QV				
3+40	0.7196	2.82	QV				
3+45	0.7391	2.83	Q V				
3+50	0.7587	2.84	Q V				
3+55	0.7783	2.85	Q V				
4+ 0	0.7981	2.86	Q V				
4+ 5	0.8179	2.88	Q V				
4+10	0.8378	2.89	Q V				
4+15	0.8577	2.90	Q V				
4+20	0.8778	2.91	Q V				
4+25	0.8979	2.92	Q V				
4+30	0.9182	2.94	Q V				
4+35	0.9385	2.95	Q V				
4+40	0.9589	2.96	Q V				
4+45	0.9794	2.98	Q V				
4+50	1.0000	2.99	Q V				
4+55	1.0206	3.00	Q V				
5+ 0	1.0414	3.02	Q V				
5+ 5	1.0623	3.03	Q V				
5+10	1.0832	3.04	Q V				
5+15	1.1043	3.06	Q V				
5+20	1.1254	3.07	Q V				
5+25	1.1467	3.09	Q V				
5+30	1.1680	3.10	Q V				
5+35	1.1895	3.11	Q V				
5+40	1.2111	3.13	Q V				
5+45	1.2327	3.14	Q V				
5+50	1.2545	3.16	Q V				
5+55	1.2763	3.18	Q V				
6+ 0	1.2983	3.19	Q V				
6+ 5	1.3204	3.21	Q V				
6+10	1.3426	3.22	Q V				
6+15	1.3649	3.24	Q V				
6+20	1.3873	3.26	Q V				
6+25	1.4099	3.27	Q V				
6+30	1.4325	3.29	Q V				
6+35	1.4553	3.31	Q V				
6+40	1.4782	3.32	Q V				
6+45	1.5012	3.34	Q V				
6+50	1.5243	3.36	Q V				
6+55	1.5476	3.38	Q V				
7+ 0	1.5709	3.39	Q V				
7+ 5	1.5944	3.41	Q V				
7+10	1.6181	3.43	Q V				
7+15	1.6419	3.45	Q V				
7+20	1.6658	3.47	Q V				
7+25	1.6898	3.49	Q V				
7+30	1.7140	3.51	Q V				
7+35	1.7383	3.53	Q V				
7+40	1.7628	3.55	Q V				
7+45	1.7874	3.57	Q V				
7+50	1.8121	3.59	Q V				
7+55	1.8370	3.62	Q V				
8+ 0	1.8621	3.64	Q V				
8+ 5	1.8873	3.66	Q V				
8+10	1.9127	3.68	Q V				
8+15	1.9382	3.71	Q V				
8+20	1.9639	3.73	Q V				
8+25	1.9897	3.75	Q V				

8+30	2.0157	3.78	Q	V				
8+35	2.0419	3.80	Q	V				
8+40	2.0683	3.83	Q	V				
8+45	2.0948	3.85	Q	V				
8+50	2.1215	3.88	Q	V				
8+55	2.1484	3.91	Q	V				
9+ 0	2.1755	3.93	Q	V				
9+ 5	2.2028	3.96	Q	V				
9+10	2.2303	3.99	Q	V				
9+15	2.2579	4.02	Q	V				
9+20	2.2858	4.05	Q	V				
9+25	2.3138	4.08	Q	V				
9+30	2.3421	4.10	Q	V				
9+35	2.3706	4.14	Q	V				
9+40	2.3993	4.17	Q	V				
9+45	2.4282	4.20	Q	V				
9+50	2.4574	4.23	Q	V				
9+55	2.4867	4.27	Q	V				
10+ 0	2.5164	4.30	Q	V				
10+ 5	2.5462	4.33	Q	V				
10+10	2.5763	4.37	Q	V				
10+15	2.6066	4.41	Q	V				
10+20	2.6372	4.44	Q	V				
10+25	2.6681	4.48	Q	V				
10+30	2.6992	4.52	Q	V				
10+35	2.7306	4.56	Q	V				
10+40	2.7623	4.60	Q	V				
10+45	2.7943	4.64	Q	V				
10+50	2.8265	4.68	Q	V				
10+55	2.8591	4.73	Q	V				
11+ 0	2.8920	4.77	Q	V				
11+ 5	2.9252	4.82	Q	V				
11+10	2.9587	4.87	Q	V				
11+15	2.9925	4.91	Q	V				
11+20	3.0267	4.96	Q	V				
11+25	3.0612	5.01	|Q	V				
11+30	3.0961	5.07	|Q	V				
11+35	3.1314	5.12	|Q	V				
11+40	3.1670	5.18	|Q	V				
11+45	3.2031	5.23	|Q	V				
11+50	3.2395	5.29	|Q	V				
11+55	3.2764	5.35	|Q	V				
12+ 0	3.3136	5.41	|Q	V				
12+ 5	3.3513	5.47	|Q	V				
12+10	3.3889	5.46	|Q	V				
12+15	3.4259	5.37	|Q	V				
12+20	3.4627	5.33	|Q	V				
12+25	3.4995	5.35	|Q	V				
12+30	3.5365	5.38	|Q	V				
12+35	3.5739	5.43	|Q	V				
12+40	3.6117	5.49	|Q	V				
12+45	3.6499	5.55	|Q	V				
12+50	3.6887	5.62	|Q	V				
12+55	3.7279	5.70	|Q	V				
13+ 0	3.7677	5.78	|Q	V				
13+ 5	3.8081	5.87	|Q	V				
13+10	3.8492	5.96	|Q	V				
13+15	3.8909	6.06	|Q	V				
13+20	3.9334	6.16	|Q	V				
13+25	3.9766	6.28	|Q	|V				
13+30	4.0206	6.39	|Q	|V				
13+35	4.0654	6.51	|Q	|V				
13+40	4.1112	6.64	|Q	|V				

13+45	4.1578	6.78	Q	V			
13+50	4.2054	6.92	Q	V			
13+55	4.2541	7.07	Q	V			
14+ 0	4.3039	7.23	Q	V			
14+ 5	4.3549	7.40	Q	V			
14+10	4.4072	7.59	Q	V			
14+15	4.4609	7.81	Q	V			
14+20	4.5162	8.02	Q	V			
14+25	4.5730	8.26	Q	V			
14+30	4.6315	8.49	Q	V			
14+35	4.6919	8.76	Q	V			
14+40	4.7541	9.03	Q	V			
14+45	4.8184	9.35	Q	V			
14+50	4.8850	9.67	Q	V			
14+55	4.9542	10.04	Q	V			
15+ 0	5.0261	10.43	Q	V			
15+ 5	5.1010	10.89	Q	V			
15+10	5.1794	11.37	Q	V			
15+15	5.2617	11.95	Q	V			
15+20	5.3483	12.57	Q	V			
15+25	5.4397	13.27	Q	V			
15+30	5.5350	13.84	Q	V			
15+35	5.6329	14.21	Q	V			
15+40	5.7357	14.94	Q	V			
15+45	5.8476	16.24	Q	V			
15+50	5.9717	18.02	Q	V			
15+55	6.1170	21.10	Q	V			
16+ 0	6.3049	27.28	Q	V			
16+ 5	6.6453	49.43	Q	V			
16+10	7.3457	101.69	Q				
16+15	8.5321	172.26		V		Q	
16+20	9.3921	124.88		QV			
16+25	9.9305	78.17	Q	V			
16+30	10.3278	57.68	Q	V			
16+35	10.6409	45.47	Q	V			
16+40	10.9009	37.75	Q	V			
16+45	11.1210	31.95	Q	V			
16+50	11.3048	26.69	Q	V			
16+55	11.4667	23.51	Q	V			
17+ 0	11.6099	20.79	Q	V			
17+ 5	11.7360	18.30	Q	V			
17+10	11.8483	16.31	Q	V			
17+15	11.9485	14.56	Q	V			
17+20	12.0368	12.81	Q	V			
17+25	12.1142	11.24	Q	V			
17+30	12.1877	10.67	Q	V			
17+35	12.2591	10.37	Q	V			
17+40	12.3269	9.86	Q	V			
17+45	12.3877	8.82	Q	V			
17+50	12.4430	8.03	Q	V			
17+55	12.4928	7.24	Q	V			
18+ 0	12.5362	6.30	Q	V			
18+ 5	12.5779	6.06	Q	V			
18+10	12.6186	5.90	Q	V			
18+15	12.6589	5.86	Q	V			
18+20	12.6988	5.79	Q	V			
18+25	12.7379	5.68	Q	V			
18+30	12.7762	5.56	Q	V			
18+35	12.8137	5.45	Q	V			
18+40	12.8505	5.33	Q	V			
18+45	12.8864	5.22	Q	V			
18+50	12.9217	5.12	Q	V			
18+55	12.9563	5.02	Q	V			

19+ 0	12.9902	4.92	Q				V
19+ 5	13.0234	4.83	Q				V
19+10	13.0561	4.74	Q				V
19+15	13.0882	4.66	Q				V
19+20	13.1197	4.58	Q				V
19+25	13.1507	4.50	Q				V
19+30	13.1811	4.42	Q				V
19+35	13.2111	4.35	Q				V
19+40	13.2406	4.28	Q				V
19+45	13.2697	4.22	Q				V
19+50	13.2983	4.16	Q				V
19+55	13.3265	4.09	Q				V
20+ 0	13.3543	4.03	Q				V
20+ 5	13.3816	3.98	Q				V
20+10	13.4087	3.92	Q				V
20+15	13.4353	3.87	Q				V
20+20	13.4616	3.82	Q				V
20+25	13.4875	3.77	Q				V
20+30	13.5131	3.72	Q				V
20+35	13.5384	3.67	Q				V
20+40	13.5634	3.63	Q				V
20+45	13.5881	3.58	Q				V
20+50	13.6125	3.54	Q				V
20+55	13.6366	3.50	Q				V
21+ 0	13.6604	3.46	Q				V
21+ 5	13.6840	3.42	Q				V
21+10	13.7073	3.39	Q				V
21+15	13.7304	3.35	Q				V
21+20	13.7532	3.31	Q				V
21+25	13.7758	3.28	Q				V
21+30	13.7981	3.25	Q				V
21+35	13.8202	3.21	Q				V
21+40	13.8422	3.18	Q				V
21+45	13.8639	3.15	Q				V
21+50	13.8853	3.12	Q				V
21+55	13.9066	3.09	Q				V
22+ 0	13.9277	3.06	Q				V
22+ 5	13.9486	3.03	Q				V
22+10	13.9693	3.01	Q				V
22+15	13.9899	2.98	Q				V
22+20	14.0102	2.95	Q				V
22+25	14.0304	2.93	Q				V
22+30	14.0504	2.90	Q				V
22+35	14.0702	2.88	Q				V
22+40	14.0899	2.86	Q				V
22+45	14.1094	2.83	Q				V
22+50	14.1288	2.81	Q				V
22+55	14.1480	2.79	Q				V
23+ 0	14.1670	2.77	Q				V
23+ 5	14.1860	2.75	Q				V
23+10	14.2047	2.72	Q				V
23+15	14.2233	2.70	Q				V
23+20	14.2418	2.68	Q				V
23+25	14.2602	2.66	Q				V
23+30	14.2784	2.64	Q				V
23+35	14.2965	2.63	Q				V
23+40	14.3144	2.61	Q				V
23+45	14.3322	2.59	Q				V
23+50	14.3499	2.57	Q				V
23+55	14.3675	2.55	Q				V
24+ 0	14.3850	2.54	Q				V
24+ 5	14.4019	2.46	Q				V
24+10	14.4169	2.17	Q				V

24+15	14.4270	1.47	Q	|	|	|	V|
24+20	14.4339	1.00	Q	|	|	|	V|
24+25	14.4391	0.75	Q	|	|	|	V|
24+30	14.4430	0.58	Q	|	|	|	V|
24+35	14.4462	0.46	Q	|	|	|	V|
24+40	14.4487	0.36	Q	|	|	|	V|
24+45	14.4506	0.29	Q	|	|	|	V|
24+50	14.4522	0.23	Q	|	|	|	V|
24+55	14.4535	0.19	Q	|	|	|	V|
25+ 0	14.4546	0.15	Q	|	|	|	V|
25+ 5	14.4554	0.12	Q	|	|	|	V|
25+10	14.4560	0.09	Q	|	|	|	V|
25+15	14.4565	0.07	Q	|	|	|	V|
25+20	14.4569	0.06	Q	|	|	|	V|
25+25	14.4572	0.05	Q	|	|	|	V|
25+30	14.4575	0.04	Q	|	|	|	V|
25+35	14.4577	0.03	Q	|	|	|	V|
25+40	14.4578	0.02	Q	|	|	|	V|
25+45	14.4579	0.01	Q	|	|	|	V|
25+50	14.4579	0.00	Q	|	|	|	V

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Operation, Design, Performance and Maintenance

CDS®

Using patented continuous deflective separation technology, the CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Inline units can treat up to 6 cfs, and internally bypass flows in excess of 50 cfs (1416 L/s). Available precast or cast-in-place, offline units can treat flows from 1 to 300 cfs (28.3 to 8495 L/s). The pollutant removal capacity of the CDS system has been proven in lab and field testing.

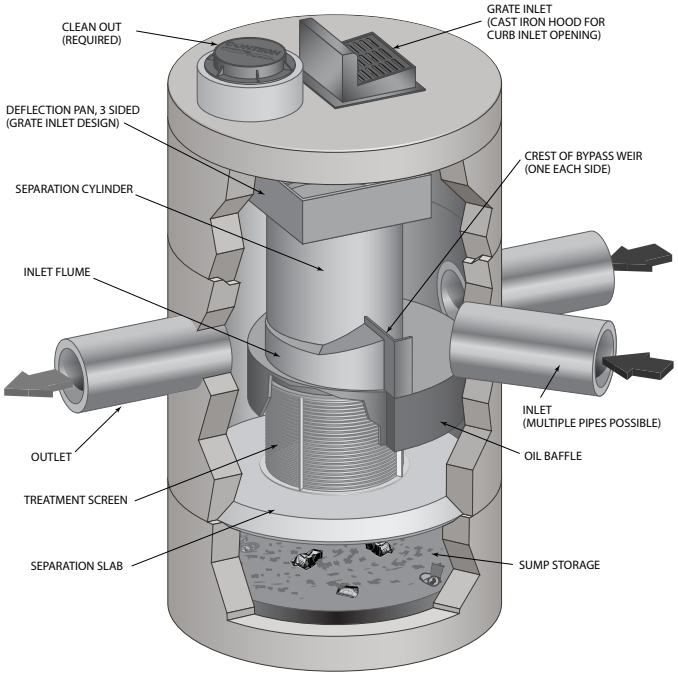
Operation Overview

Stormwater enters the diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed from the flow. All flows up to the system's treatment design capacity enter the separation chamber and are treated.

Swirl concentration and screen deflection force floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.

Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During the flow events exceeding the treatment design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants are retained in the separation cylinder.



Design Basics

There are three primary methods of sizing a CDS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow rate for a defined particle size. The Rational Rainfall Method™ or the and Probabilistic Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically in the Unites States, CDS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a gradation with an average particle size (d50) of 125 microns (μm). For some regulatory environments, CDS systems can also be designed to achieve an 80% annual solids load reduction based on an average particle size (d50) of 75 microns (μm) or 50 microns (μm).

Water Quality Flow Rate Method

In some cases, regulations require that a specific treatment rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval, e.g. the six-month storm, or a water quality depth, e.g. 1/2-inch (13 mm) of rainfall.

The CDS is designed to treat all flows up to the WQQ. At influent rates higher than the WQQ, the diversion weir will direct most flow exceeding the WQQ around the separation chamber. This allows removal efficiency to remain relatively constant in the separation chamber and eliminates the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the CDS will remove a specific gradation of sediment at a specific removal efficiency. Therefore the treatment flow rate is variable, based on the gradation and removal efficiency specified by the design engineer.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. It is important to take these factors into consideration when estimating the long-term performance of any stormwater treatment system. The Rational Rainfall Method combines site-specific information with laboratory generated performance data, and local historical precipitation records to estimate removal efficiencies as accurately as possible.

Short duration rain gauge records from across the United States and Canada were analyzed to determine the percent of the total annual rainfall that fell at a range of intensities. US stations' depths were totaled every 15 minutes, or hourly, and recorded in 0.01-inch increments. Depths were recorded hourly with 1-mm resolution at Canadian stations. One trend was consistent at all sites; the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Rainfall Method. Since most sites are relatively small and highly impervious, the Rational Rainfall Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS system are

determined. Performance efficiency curve determined from full scale laboratory tests on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Probabilistic Rational Method

The Probabilistic Rational Method is a sizing program Contech developed to estimate a net annual sediment load reduction for a particular CDS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics.

The Probabilistic Method is an extension of the Rational Method used to estimate peak discharge rates generated by storm events of varying statistical return frequencies (e.g. 2-year storm event). Under the Rational Method, an adjustment factor is used to adjust the runoff coefficient estimated for the 10-year event, correlating a known hydrologic parameter with the target storm event. The rainfall intensities vary depending on the return frequency of the storm event under consideration. In general, these two frequency dependent parameters (rainfall intensity and runoff coefficient) increase as the return frequency increases while the drainage area remains constant.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Method. Since most sites are relatively small and highly impervious, the Rational Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS are determined. Performance efficiency curve on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Treatment Flow Rate

The inlet throat area is sized to ensure that the WQQ passes through the separation chamber at a water surface elevation equal to the crest of the diversion weir. The diversion weir bypasses excessive flows around the separation chamber, thus preventing re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

The hydraulic capacity of a CDS system is determined by the length and height of the diversion weir and by the maximum allowable head in the system. Typical configurations allow hydraulic capacities of up to ten times the treatment flow rate. The crest of the diversion weir may be lowered and the inlet throat may be widened to increase the capacity of the system at a given water surface elevation. The unit is designed to meet project specific hydraulic requirements.

Performance

Full-Scale Laboratory Test Results

A full-scale CDS system (Model CDS2020-5B) was tested at the facility of University of Florida, Gainesville, FL. This CDS unit was evaluated under controlled laboratory conditions of influent flow rate and addition of sediment.

Two different gradations of silica sand material (UF Sediment & OK-110) were used in the CDS performance evaluation. The particle size distributions (PSDs) of the test materials were analyzed using standard method "Gradation ASTM D-422 "Standard Test Method for Particle-Size Analysis of Soils" by a certified laboratory.

UF Sediment is a mixture of three different products produced by the U.S. Silica Company: "Sil-Co-Sil 106", "#1 DRY" and "20/40 Oil Frac". Particle size distribution analysis shows that the UF Sediment has a very fine gradation (d50 = 20 to 30 μm) covering a wide size range (Coefficient of Uniformity, C averaged at 10.6). In comparison with the hypothetical TSS gradation specified in the NJDEP (New Jersey Department of Environmental Protection) and NJCAT (New Jersey Corporation for Advanced Technology) protocol for lab testing, the UF Sediment covers a similar range of particle size but with a finer d50 (d50 for NJDEP is approximately 50 μm) (NJDEP, 2003).

The OK-110 silica sand is a commercial product of U.S. Silica Sand. The particle size distribution analysis of this material, also included in Figure 1, shows that 99.9% of the OK-110 sand is finer than 250 microns, with a mean particle size (d50) of 106 microns. The PSDs for the test material are shown in Figure 1.

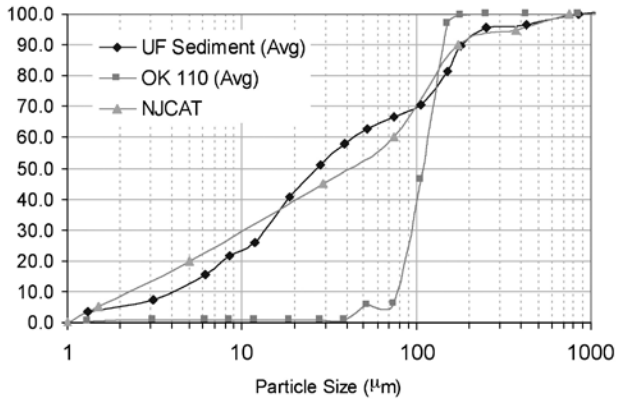


Figure 1. Particle size distributions

Tests were conducted to quantify the performance of a specific CDS unit (1.1 cfs (31.3-L/s) design capacity) at various flow rates, ranging from 1% up to 125% of the treatment design capacity of the unit, using the 2400 micron screen. All tests were conducted with controlled influent concentrations of approximately 200 mg/L. Effluent samples were taken at equal time intervals across the entire duration of each test run. These samples were then processed with a Dekaport Cone sample splitter to obtain representative sub-samples for Suspended Sediment Concentration (SSC) testing using ASTM D3977-97 "Standard Test Methods for Determining Sediment Concentration in Water Samples", and particle size distribution analysis.

Results and Modeling

Based on the data from the University of Florida, a performance model was developed for the CDS system. A regression analysis was used to develop a fitting curve representative of the scattered data points at various design flow rates. This model, which demonstrated good agreement with the laboratory data, can then be used to predict CDS system performance with respect

to SSC removal for any particle size gradation, assuming the particles are inorganic sandy-silt. Figure 2 shows CDS predictive performance for two typical particle size gradations (NJCAT gradation and OK-110 sand) as a function of operating rate.

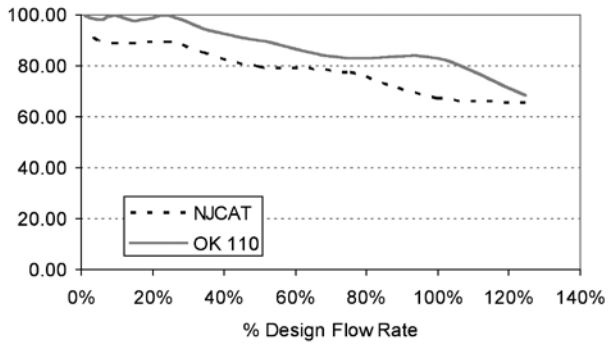


Figure 2. CDS stormwater treatment predictive performance for various particle gradations as a function of operating rate.

Many regulatory jurisdictions set a performance standard for hydrodynamic devices by stating that the devices shall be capable of achieving an 80% removal efficiency for particles having a mean particle size (d50) of 125 microns (e.g. Washington State Department of Ecology — WASDOE - 2008). The model can be used to calculate the expected performance of such a PSD (shown in Figure 3). The model indicates (Figure 4) that the CDS system with 2400 micron screen achieves approximately 80% removal at the design (100%) flow rate, for this particle size distribution (d50 = 125 μm).

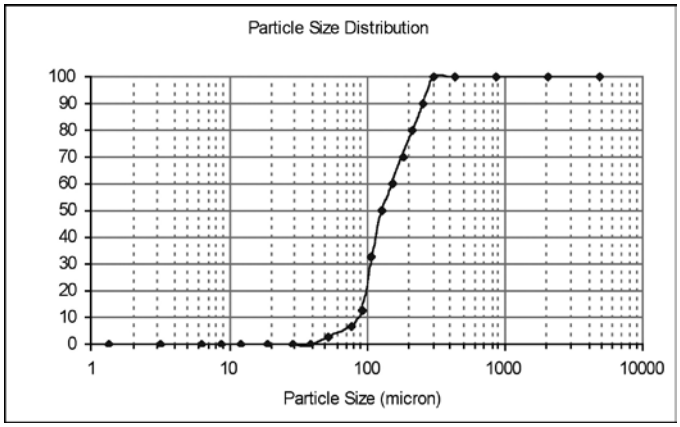


Figure 3. WASDOE PSD

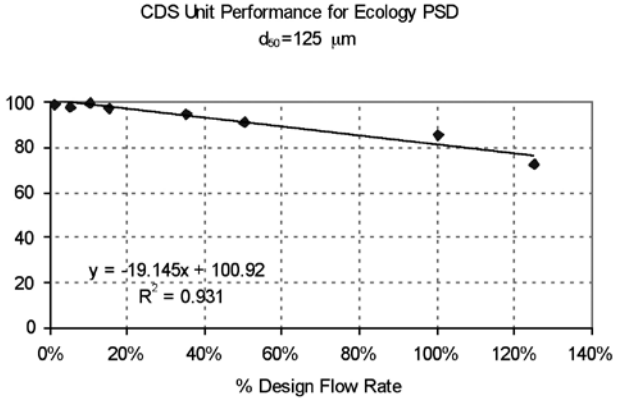


Figure 4. Modeled performance for WASDOE PSD.

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified

during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

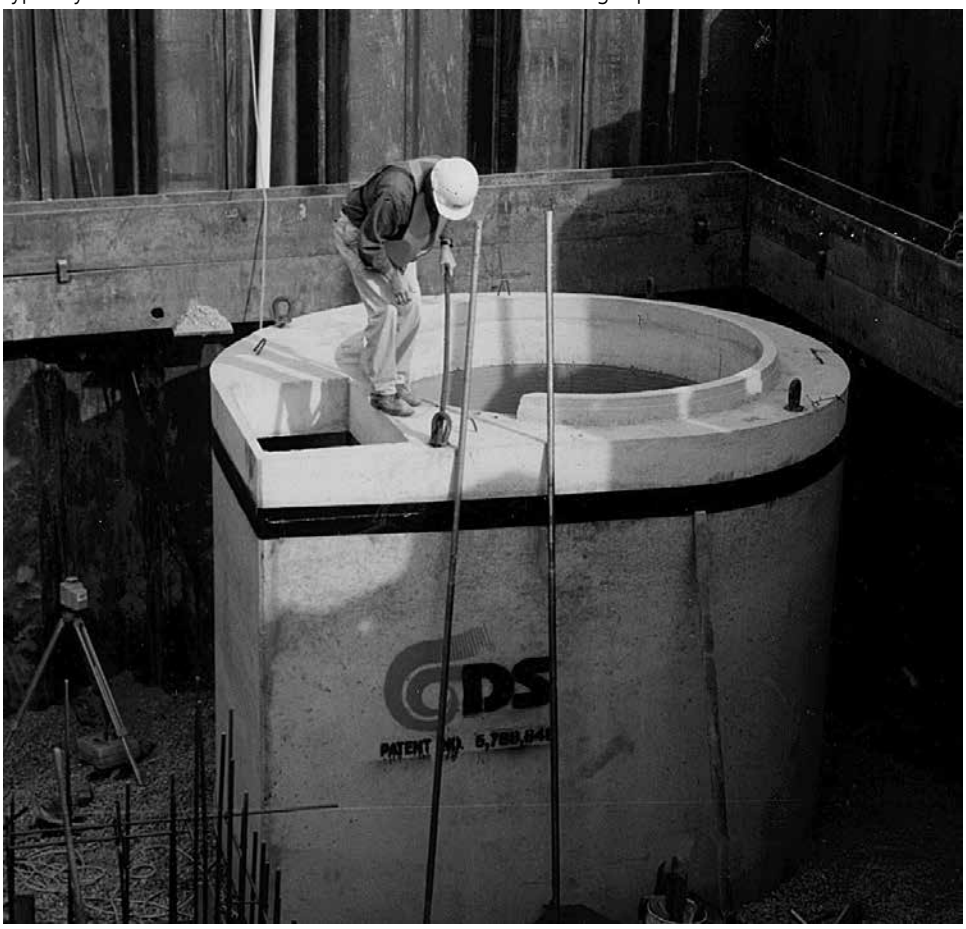
In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be cleaned to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Note: To avoid underestimating the volume of sediment in the chamber, carefully lower the measuring device to the top of the sediment pile. Finer silty particles at the top of the pile may be more difficult to feel with a measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.



CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile**.

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

PWQMP Checklist

Project Name: Johnson Road 350,000 sq ft. Industrial building

Prepared For:

Owner/Developer Name Simon Bouzzaglou/55555 Amargosa LLC

Address 5901 South Eastern Avenue

Street, City, State, ZIP Commerce, CA 90040

Phone Number 323-423-3150

Prepared By:

Engineer Name David W. Larson

RCE # 052991

Engineering Firm Name Red Brick Solution

Address 2892 S. Kollman Lane

City, State, ZIP Saratoga Springs, UT. 84045

Phone Number 661-816-5179

Project Description: After rd. decication 18.2 ac. with +/- 350,000 sq ft. Industrial Bldg. w/associated parking, bays and Lmt'ed landscaping

Regulated Development Project Category: Zoned: Industrial NAVISP, I-G

■ #1 New Development involving the creation of 5,000 ft^2 or more of impervious surface collectively over entire site.	☐ #2 Significant redevelopment involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site.	☐ #3 Road Project – any road, sidewalk, or bicycle lane project that creates greater than 5,000 ft^2 of contiguous impervious surface.	☐ #4 LUPs – linear underground/overhead projects that has a discrete location with 5,000 ft^2 or more of new constructed impervious surface.

Project Area (ft^2):

Project Type: (e.g. residential, commercial, industrial)

Project Location:

SUPPORT

- Drawings and specifications are available at www.ContechES.com.
- Site-specific design support is available from our engineers.

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Contech Engineered Solutions provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, earth stabilization and stormwater treatment products. For information on other Contech division offerings, visit www.ContechES.com or call 800.338.1122

The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; related foreign patents or other patents pending.

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Site Design Practices:

Site Design Practices Checklist

Site Design Practices

If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets

Minimize impervious areas: Yes ☑ No ☐

Explanation:

On site channels will not be lined and are used as retention basins

Maximize natural infiltration capacity; Including improvement and maintenance of soil: Yes ☐ No ■

Explanation:

Preserve existing drainage patterns and time of concentration: Yes ■ No ☐

Explanation:

Off-site drainage will exit the site as historic native flows and on-site post-developed flows will be detained and exit the site at historic conveyance points.

Disconnect impervious areas. Including rerouting of rooftop drainage pipes to drain stormwater to storage or infiltration BMPs instead of to storm drain: Yes ☐ No ■

Explanation:

Use of Porous Pavement: Yes ☐ No ■

Explanation:

Due to high silt movement potential, porous pavement is not a viable solution in the high desert.

Protect existing vegetation and sensitive areas: Yes ☐ No ■

Explanation:

There are no sensitive areas on the site and the existing desert vegetation is not conducive to this environment.

Re-vegetate disturbed areas. Including planting and preservation of drought tolerant vegetation: Yes ■ No ☐

Explanation:

Landscape areas will be vegetated with drought tolerant vegetation.

Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☐ No ■

Explanation:

The retention basin is located underneath the dock areas and will need to be compacted adequately to protect the pavement.

Utilize naturalized/rock-lined drainage swales in place of underground piping or imperviously lined swales: Yes ☐ No ■

Explanation:

Storm water conveyances are not alligned with the perimiter landscape areas.

Stake off areas that will be used for landscaping to minimize compaction during construction: Yes ☐ No ■

Explanation:

Landscape areas will need trasition slopes that will be graded with heavy equipment.

Use of Rain Barrels and Cisterns, Including the use of on-site water collection systems: Yes ☐ No ■

Explanation:

The project is to large for such systems.

Stream Setbacks. Includes a specified distance from an adjacent steam: Yes ☐ No ■

Explanation:

Project will be rerouting streams and returning them to their historic conveyances prior to leaving the site.

LID Design Capture Volume:

LID BMP Performance Criteria for Design Capture Volume

1 Project area DA 1 (ft^2): 792,792	**2** Imperviousness after applying preventative site design practices (Imp%): 85%	**3** Runoff Coefficient (Rc): _ 0.661 *$R_c = 0.858(Imp\%)^{3}-0.78(Imp\%)^{2}+0.774(Imp\%)+0.04$*

4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.359 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

5 Compute P_6, Mean 6-hr Precipitation (inches): 0.444

*P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)*

6 Drawdown Rate

Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.

24-hrs ☐
48-hrs ■

7 Compute design capture volume, DCV (ft^3): 37,606 (0.86 AF)

*DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)*
Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2

Infiltration BMP Feasibility:

Infiltration BMP Feasibility

Feasibility Criterion – Complete evaluation for each DA on the Project Site

[1] Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ■
Refer to Section 5.3.2.1 of the TGD for WQMP

If Yes, Provide basis: (attach)

[2] Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ■
(Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):

- The location is less than 50 feet away from slopes steeper than 15 percent
- The location is less than ten feet from building foundations or an alternative setback.
- A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.

If Yes, Provide basis: (attach)

[3] Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ■

If Yes, Provide basis: (attach)

[4] Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ■

If Yes, Provide basis: (attach)

[5] Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ■

If Yes, Provide basis: (attach)

[6] Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ■
See Section 3.5 of the TGD for WQMP and WAP

If Yes, Provide basis: (attach)

[7] Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ■
If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Selection and Evaluation of Biotreatment BMP.
If no, then proceed to Item 8 below.

[8] Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ■
If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Site Design BMP.
If no, then proceed to Item 9, below.

[9] All answers to Item 1 through Item 6 are "No":
Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.
Proceed to Form 4.3-2, Site Design BMPs.

Infiltration BMPs:

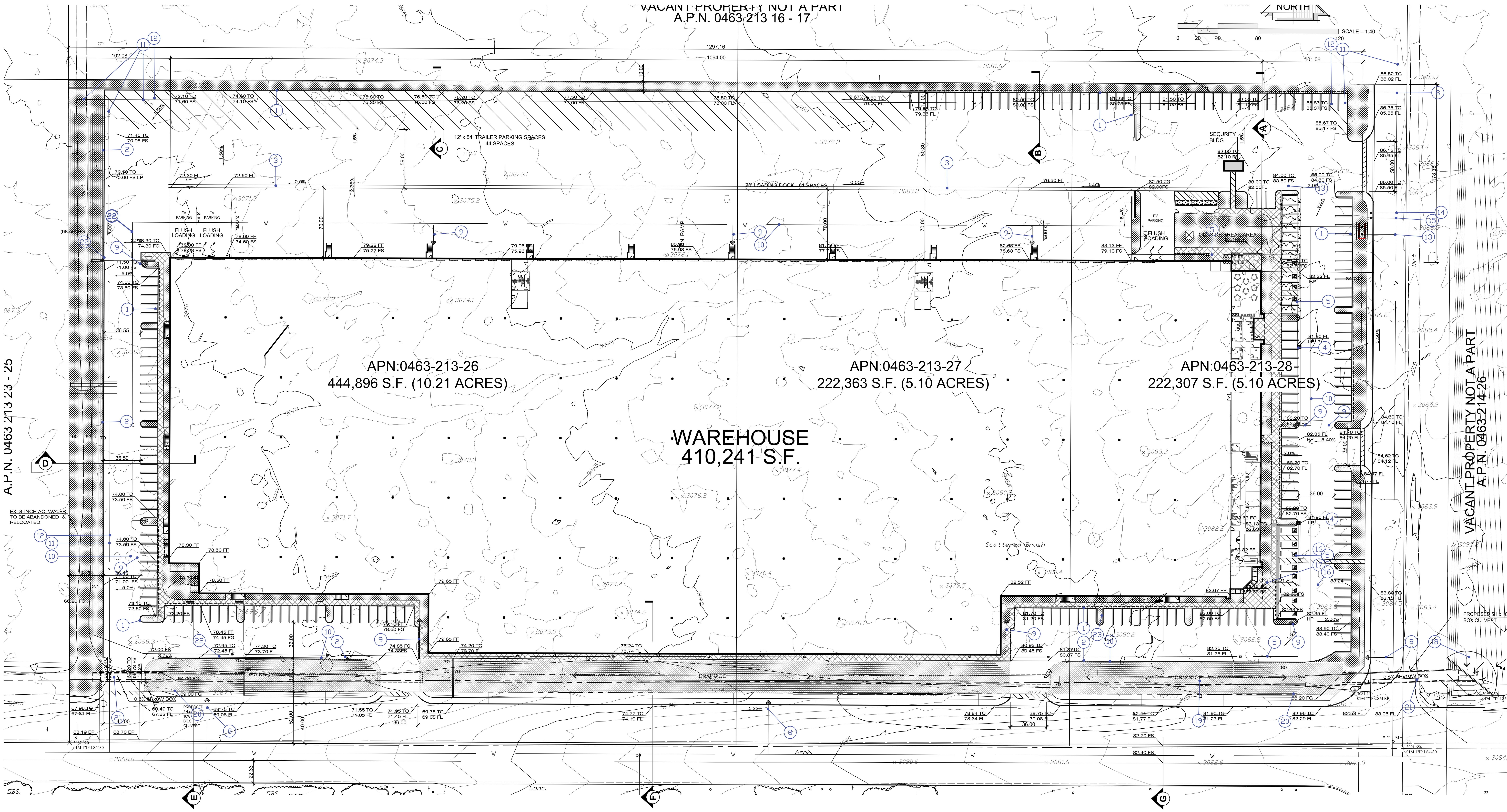
Selection of Infiltration BMPs	
Pre-treatment BMPs (required for infiltration)	Infiltration BMPs Retention basin
■ Catch Basin Filter Inserts Old castle drop inlet filters. ☐ Vegetated Swale ☐ Hydrodynamic Separator ☐ Filter Strip ☐ Sedimentation Forebay ☐ Other	■ Infiltration Basin ☐ Infiltration Trench ☐ Bioretention with no underdrain ☐ Drywell[1] ☐ Underground Infiltration System[1]

Note[1]: Class V Injection Wells (including underground infiltration systems) must be registered with the U.S. EPA Region 9's Underground Injection Control (UIC) Program.

Biotreatment BMPs:

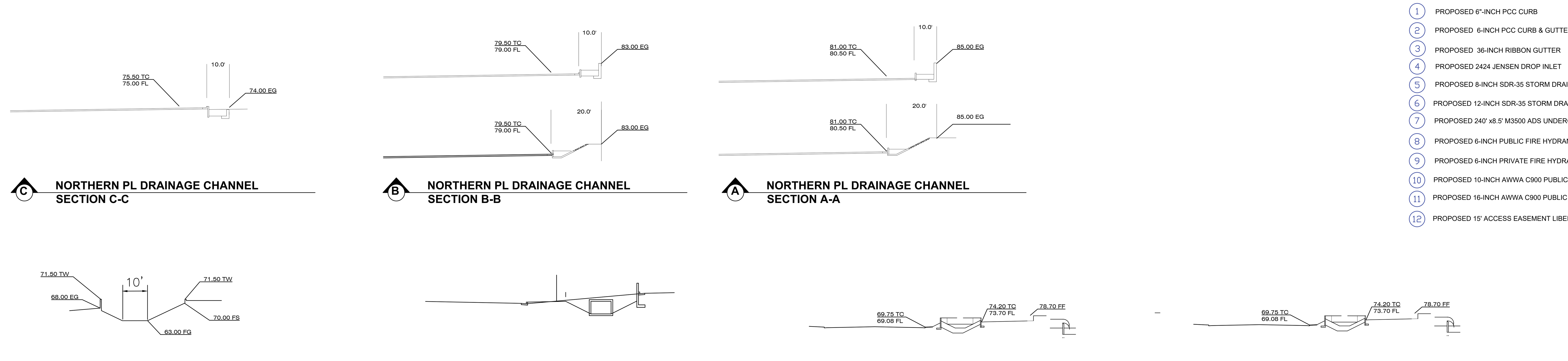
Selection of Biotreatment BMPs		
2 Biotreatment BMP Selected *(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)*	Volume-based biotreatment NA	Flow-based biotreatment NA
	☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	N/A ☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment

Discuss all items checked “Yes” on previous page:



KEYNOTES:

1. PROPOSED 6"-INCH PCC CURB
2. PROPOSED 6-INCH PCC CURB & GUTTER
3. PROPOSED 36-INCH RIBBON GUTTER
4. PROPOSED 2424 JENSEN DROP INLET
5. PROPOSED 8-INCH SDR-35 STORM DRAIN PIPE
6. PROPOSED 12-INCH SDR-35 STORM DRAIN PIPE
7. PROPOSED 240' x8.5' M3500 ADS UNDERGROUND BASIN
8. PROPOSED 6-INCH PUBLIC FIRE HYDRANT SERVICE
9. PROPOSED 6-INCH PRIVATE FIRE HYDRANT SERVICE
10. PROPOSED 10-INCH AWWA C900 PUBLIC WATER MAIN
11. PROPOSED 16-INCH AWWA C900 PUBLIC WATER MAIN
12. PROPOSED 15' ACCESS EASEMENT LIBERTY UTILITIES
13. PROPOSED 10-INCH RPDA
14. PROPOSED 1-INCH WATER SERVICE
15. PROPOSED 1-INCH LANDSCAPE WATER SERVICE
16. PROPOSED 6-INCH SDR -35 SANITARY SEWER PIPE
17. PROPOSED 4-INCH SDR -35 SANITARY SEWER CLEAN OUT
18. PROPOSED OFF-SITE DRAINAGE CHANNEL
19. PROPOSED ON-SITE DRAINAGE CHANNEL
20. PROPOSED DRAINAGE HEADWALL
21. PROPOSED 5Hx10W BOX CULVERT
22. PROPOSED 5'-DIA CDS2020-5 CLARIFIER
23. 12" WIDE STEPPING STRIP COMBINE W/ 6" CURB (18" WD. MONO POUR)



C — NORTHERN PL DRAINAGE CHANNEL SECTION C-C

B — NORTHERN PL DRAINAGE CHANNEL SECTION B-B

A — NORTHERN PL DRAINAGE CHANNEL SECTION A-A

D — WESTERN PL DRAINAGE CHANNEL SECTION D-D

E — SOUTHERN PL DRAINAGE CHANNEL SECTION E-E

F — SOUTHERN PL DRAINAGE CHANNEL SECTION F-F

G — SOUTHERN PL DRAINAGE CHANNEL SECTION G-G

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DATE FINISHED

REVISIONS

THESE PLANS SHALL COMPLY WITH THE 2019 CALIFORNIA BUILDING CODE WHICH ADOPTS THE 2019 CMC, 2019 CPC, 2019 CEC, 2019 CGC, 2019 CRC AND THE 2019 ENERGY STANDARDS

CONSULTANT

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REGISTRATION

REGISTERED PROFESSIONAL ENGINEER
DAVID W LARSON
No. C 52991
EXP 12-31-2022
CIVIL
STATE OF CALIFORNIA

OWNER

PROJECT: COMMERCIAL DEVELOPMENT

JOHNSON RD INDUSTRIAL

PROJECT ADDRESS:
JOHNSON AND NAVAJO RD, APPLE VALLEY, CA
A.P.N 0463-213-26,27,28

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JOB NO.

SHEET NAME:

GRADING PLAN

PAGE

C1.0

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